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Vol. I

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1939

No. 681

RAILROAD COMMISSION OF TEXAS ET AL.,
PETITIONERS,

vs.

ROWAN & NICHOLS OIL COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT
OF APPEALS FOR THE FIFTH CIRCUIT

PETITION FOR CERTIORARI FILED JANUARY 29, 1940.

CERTIORARI GRANTED MARCH 11, 1940.

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CAPTION.

BE IT REMEMBERED, That at a regular term of the United States District Court in and for the Western District of Texas, the Honorable Robert J. McMillan, United States District Judge, presiding, and holding its sessions at Austin, Texas, which said term began on the 12th day of June, A. D. 1939, and continued in session to and included the 14th day of June, A. D. 1939, there came on to be heard and determined, among other causes pending on the docket, the following cause:

No. 624 In Equity.

ROWAN & NICHOLS OIL COMPANY,

versus

RAILROAD COMMISSION OF TEXAS, ET AL.

COMPLAINANT'S ORIGINAL BILL OF COMPLAINT.

2

(Title Omitted.)

To said Honorable Court:

Comes now Rowan & Nichols Oil Company, hereinafter styled Complainant, and complaining of the Railroad Commission of Texas, C. V. Terrell, Lon A. Smith, Ernest O. Thompson, and William McCraw, in their official capacities; hereinafter styled Respondents, files this its original Bill of Complaint, and for cause of action, respectfully shows unto the Court the following:

I.

Complainant is a private corporation, duly organized and existing under and by virtue of the laws of the

State of Texas, with principal domicile in Fort Worth, Tarrant County, Texas, Respondent, Railroad Commission of Texas, is a duly created and existing agency of the State of Texas charged with the administration of the conservation laws of the State of Texas, affecting oil and gas production, and Respondents, C. V. Terrell, Lon A. Smith, and Ernest O. Thompson, are the duly elected, qualified and acting members of said Commission, with official residences in Travis County, Texas, and Respondent William McCraw is the duly elected, qualified and acting attorney general of the State of Texas with official residence in Travis County, Texas. Service may be had on the Railroad Commission in this case by delivery of process to C. F. Petet, who resides in Travis County, Texas.

II.

The jurisdiction of the subject-matter and parties in this cause is vested in this Court upon the following grounds:

(a) This suit is of a civil nature and arises under the constitution and laws of the United States of America, as hereinafter more fully set out, and the orders complained of are especially repugnant to the due process and equal protection clauses of the Fourteenth Amendment to the Constitution of the United States.

(b) The value of the property and the amount involved is in excess of \$3,000.00, exclusive of interest.

III.

Complainant is the owner of an oil, gas and mineral leasehold estate in a certain 24.99 acre tract situated and located in the W. H. Castleberry League in Gregg County, Texas, B. C. Todd, et al, fee owners, more particularly described in the lease attached hereto, marked Exhibit

"A", and made a part hereof, said oil and gas lease being recorded in the Oil and Gas Lease Records of Gregg County, Volume 98, Page 562, et seq., to which reference is here made. Thereunder, Complainant owns seven-eighths of the oil, gas and other minerals in place under said land and the right to enter thereon and by mining operations reduce said minerals to physical possession, and has five wells drilled in accordance with the existing rules, regulations, and orders of the Railroad Commission and producing oil from said land. Complainant is producing from said lease, in accordance with the order of the Railroad Commission of Texas, dated August 29, 1938, the following number of barrels per day: Well No. 1, 22.388; Well No. 2, 22.272; Well No. 3, 22.388; Well No. 4, 22.504; Well No. 5, 22.272.

IV.

Complainant's lease and the wells producing thereon are located in what is known as the East Texas oil field. Said field is water-driven and embraces a territory of about forty miles in length and four miles in width. The west side of the field is underlain with what is known as "bottom water"; no water underlies the east half, and the water is slowly but perceptibly rising in the western portion thereof, one well to ten acres can reasonably drain such area in the East Texas field during the flowing life thereof, if produced under proper restrictions and in accordance with good petroleum practice; said field is substantially a flowing field. There are approximately 133,000 acres underlain by oil in said field, and the average sand thickness of the oil bearing sand is 42 feet, whereas the sand thickness under Complainant's lease is 100 feet; there are approximately 5,586,000 acre feet of oil sand in the entire field and 2,499 acre feet of oil sand under Complainant's lease;

the production of oil from said field as of August 31, 1938, was 1,238,080,665 barrels, and from Complainant's lease as of August 31, 1938, 345,165.59 barrels; the average controlled potential of a well in East Texas is 605 barrels, and the average controlled potential of each well on Complainant's lease is 964 barrels. As of August 30, 1938, there were approximately 25,500 wells producing and authorized to be drilled in said field, of which number, over sixty per cent were allowed as exceptions to Rule 37, of the rules and regulations of the Railroad Commission, copy of which is attached hereto and marked Exhibit "B"; the uncontrolled potential of wells in said field varies from less than 20 barrels per well to 30,000 barrels per well per day. Complainant's wells are situated in what is known as the "Gladewater Nose",

5

which is most favorably situated on the structure and producing horizon of the East Texas field, equidistant between the eastern and western limits thereof. The oil saturated sands thereunder are of maximum thickness, and there is no danger of encroachment of water, at the present time and for a long time to come, with the result that said wells can be continually produced for many months without an excessive oil and gas ratio and with no physical waste, and without the danger of creating an element set forth in the statutes which would authorize Respondents to artificially restrict production from Complainant's wells except under reasonable exercise of the State's police power. The oil production sands to the East of Complainant's property are of continually decreasing thickness, pinching out to nothing on the eastern edge. None of the wells lying between Complainant's property and the Eastern edge are capable of producing nearly as much oil as Complainant's wells, and none of the wells lying between Complainant's property and the western edge of the field are capable of producing for as long a time as Complainant's wells, unless by artificial methods of restriction,

such as the Commission is now requiring, Complainant's production is cut down. If the field is produced in an orderly manner, and as near ratably as may be, each person withdrawing oil underlying his land, and which can be brought to his well by proper production methods, will produce from his well in accordance with the advantage of its situation.

The total recoverable oil under Complainant's lease, based upon the porosity, permeability, oil saturation, and thickness of the sand underlying the lease, is approximately 57,000 barrels per acre, and the total recoverable oil in the common pool existing in the East Texas field is approximately 2,000,000 barrels.

V.

Under the laws of the State of Texas as construed by the decisions of the highest Court in the State of Texas an operator of an oil and gas lease is the owner
 6 in severalty of the oil and gas in place beneath the land under the lease to him and has a property right entitling him to an opportunity equal to that of adjoining operators in the production of oil from the common reservoir. Likewise he has no cause of action for damages by reason of the recovery through drainage by his neighbor of the oil originally underlying his tract, and by reason of the provisions of Rule 37 is not entitled to the same degree of self help for the protection from drainage as was accorded to him under the common law rule of capture.

There has been ascertained and can be ascertained in the East Texas field accurate information as to the sand thickness, properties of the reservoir sands, and their fluid contents; so as to estimate the quantities of oil and gas present as of any particular date, in almost any portion of the reservoir. The computation can be made and

has been made with a degree of accuracy which is sufficiently precise to establish a basis for equitable allocation of production to the owners of oil and gas in place, so as to accord unto each one an equal opportunity to recover his fair share of the oil, as has been done in other fields where sand conditions are not as uniform as those in East Texas.

VI.

Complainant is now being compelled to artificially restrict its production from its wells by order of the Railroad Commission dated August 29, 1938, copy of which is attached hereto and marked Exhibit "C". By reason of said order each well is permitted to produce daily a maximum of only 2.32% of its hourly potential capacity as determined by the Commission, except certain wells are permitted to produce not less than 20 barrels per day, regardless of their potential capacity. If Complainant produces in excess of said allowable, it will be subjected to penalties in the form of fines and severe forfeitures and is penalized by being unable to transport such excess oil in intrastate, interstate, or foreign commerce.

VII.

Complainant could effectively drain its fair share of the oil through the wells located on its lease at the present time, if its daily allowable bore the same relation to the total daily allowable as the recoverable oil thereunder bears to the total recoverable oil in the field. But Respondents do not adjust the allowable between wells on any basis other than the controlled potential of said wells, as determined by the Commission which is fiction and not fact, with the result that an operator, including Complainant, is placed in the position of either surrendering its property through drainage, or being com-

pelled to drill additional and unnecessary wells, if permit therefor is granted by the Commission, to offset the drainage caused by the granting of other wells on small tracts as more particularly hereinafter set out. Respondent Commissioners have publicly announced that they do not take into consideration the confiscatory cost of drilling offsets and regard an operator's only remedy as that of offset, whatever the cost may be, to prevent drainage of his property under the allocation of allowable, and do not consider that proration or ratable production bears any relation to or has any connection with the drilling of wells. Said plan of proration entirely disregards differences as to each well in its productive capacity, situation on the structure, thickness and character as to the richness and yield of the underlying sands, and the density to which leases have been drilled, and proximity of water. By reason of said order and its artificial restriction methods, Complainant's allowable does not bear the same proportion to the total daily allowable as the recoverable oil under its lease bears to the total recoverable oil in said East Texas field.

8 If Complainant's allowable was based on the formula just stated it would approximate 235 barrels per day, but instead, approximates only 112 barrels per day.

VIII.

The plan of proration now maintained does not take into consideration acreage of leases or density of drilling on leases, with the result that an operator having one well on one acre may recover daily and ultimately ten times as many barrels of oil per acre as the operator of an adjoining lease which is drilled to a density of only one well to ten acres, although the amount of recoverable oil per acre under each lease is the same, and thereby the operators of the more densely drilled tract

is given an advantage over the operators of the adjoining less densely drilled tract in the production of oil in violation of the declared property right, and such operator of the more densely drilled area is allowed to drain and take oil belonging to the operators of the adjoining tract. For example, the Respondent Commission has granted a permit to R. M. Wood on a strip immediately to the south of Complainant's lease, comprising approximately one-tenth of an acre and he is being permitted to produce, and has produced from said one well since its completion on August 22, 1937, 22,272 barrels per day from said one well which is as much as Complainant is permitted to produce from any of its five wells, although Complainant's lease comprises 25 acres, or one well to each five acres, and the amount of recoverable oil per acre under said two tracts is approximately the same, and thereby said R. M. Wood is permitted, by the order of the Commission, to take Complainant's oil.

There are contained in the East Texas field many hundreds of tracts of less than five acres, and of less than ten acres, on which the Commission has authorized the drilling of an average of one well to one acre.

9 From many of these tracts, the production has been far in excess of the amount of oil which underlay same and by reason of the plan of proration herein complained of said tracts, and particularly those to the east of Complainant's lease, have as much oil under same as had originally been there. The rate of the withdrawal from each well on said tracts has been substantially equal to that of Complainant's wells. Said numerous tracts, by reason of the present plan of proration, have been draining the recoverable oil and dissipating the producing energy from Complainant's land, and their reserves have risen and will continue to rise while Complainant's will decrease and continue to de-

crease. If the present proration plan is maintained, Complainant will lose oil to which it is entitled to the wells on the east side of the field, long prior to the exhaustion of the oil and gas in the reservoir, the water will saturate Complainant's wells, drowning them out, and sands lying to the east will produce the oil which will have been driven from Complainant's lease to theirs, as a result of all of which said order is discriminatory, confiscatory, oppressive, and grossly inequitable.

IX.

Complainant is entitled to the fullest use and enjoyment of its property and to the recovery of the minerals thereunder, co-extensive with the use and enjoyment of other properties situated in said field, and so long as Complainant's use and enjoyment does not interfere with the use and enjoyment by others of their properties in said field and does not conflict with the public welfare, Complainant is entitled to exercise its rights of ownership and the reasonable use of its property, if it can ratably recover the minerals to which it is legally and constitutionally entitled according to the favorable position and amount of its acreage, the sand thickness, bottom hole pressure, and other proper determinative factors of ultimate recovery therefrom without committing physical waste and without unreasonably interfering with others in the enjoyment of their properties located in said field and consistent with the reasonable requirements of public welfare.

X.

The straight potential basis of allocation is inequitable, arbitrary, and unreasonable because it can be equitable only if well spacing is uniform, and if well potentials are proportional to recoverable oil in place in the drainage area of each well, and if potentials are taken on each

individual well in the field instead of ~~on~~ only a few "key" wells and fictitious potential contour lines drawn governing the potential ability of the other wells to produce. Notwithstanding the potential of the wells, located on Complainant's lease is practically the highest in the field and notwithstanding its favored position on the structure, the disparity between the daily allowable of Complainant's wells and that of the poorest wells in the field is less than four barrels. The effect of the present plan of proration is to apportion the allowable on a practically per well basis, because no matter how many wells an operator has drilled upon his lease, he is permitted to produce 2.32% of the hourly potential of each of said wells as determined by the Commission. Said order therefore bears no reasonable relation to the prevention of physical waste, but transcends public necessity and assumes the character of a mere arbitrary fiat. Until and unless said daily allowable of 235 barrels per day, is allocated to Complainant's lease and the production thereon permitted by the Respondent Commission, Complainant will not have and is being deprived of an equal opportunity with other owners in the East Texas field to recover that portion of the oil to which it is entitled, and consequently the enforcement of said proration order by the Commission against Complainant is to deprive Complainant of property without due
 11 process of law, and it not receiving the equal protection of the law as guaranteed to it by the Constitution of the State of Texas and the United States.

XI.

Complainant can produce what it contends is its fair share of the oil and daily allowable without causing waste and alleges that its request is proper, reasonable, and fair, and one to which it is entitled to under the Constitution and laws of this State and the United States.

Complainant can produce from its wells the amount of oil to which it is equitably entitled without dissipation of the gas energy or water drive, injury to the sands, or other formation, with reasonable gas-oil ratio, without any underground or other waste, without unlawful injury to the property of adjoining lessees, and without violating any of the statutes or orders of the Commission, with reference to waste, other than those complained of herein, and all of which oil so produced will not be in excess of the market demand.

XII.

On or about February 24, 1938, Complainant filed with the Railroad Commission of Texas an application requesting an adjustment of allowable so that it would have an equal opportunity to recover its fair share of oil, and, in the alternative, if it was shown not to be entitled by law to such relief, that it be granted permits to drill twenty more wells, so as to give it a density commensurate with that of its neighbor, although it insisted and insists now that it did not need more wells, but more allowable. A hearing on said application was held on March 11, and on March 17, the Commission entered its order denying all of said application, except to grant Complainant one well as a direct equidistant offset to the well theretofore granted by said Commission to said R. M. Wood. Said order is attached hereto and marked Exhibit "D". By motion for rehearing,

12 copy of which is attached hereto and marked Exhibit "E", Complainant asked that the Commission's order denying its relief, be set aside and held for naught, for the reasons stated therein, and alleging again it did not need more wells, but more oil. On March 31, by order of said date, copy of which is attached hereto and marked Exhibit "F", said motion for rehearing was granted, and said rehearing was held before

certain employees of the Railroad Commission on May 4, 1938. In addition thereto, Complainant appeared before the Commission at its Statewide hearings on March 17, 1938, and May 17, 1938, and presented and renewed its application for an adjustment of allowable, and, in the alternative, for additional wells, and directed the Commission's attention to the fact that its plan of allocation was unfair, inequitable, and contrary to Complainant's constitutional rights, but notwithstanding said representations and although the Commission has had ample time in which to pass upon the application, and although Complainant, through its counsel, has repeatedly requested relief, said Commission has wholly failed and refused to give any consideration whatsoever to Complainant's rights in the premises. At said hearing Complainant informed the Commission that if its prayer for alternative relief in any way affected its right to increase its allowable, it then and there withdrew its request for alternative relief. For a long time past and at the present time, notwithstanding the protest of Complainant, the Respondent Commission's monthly proration orders have adopted the same basis for restriction, to-wit, an hourly potential as determined by the Commission, and by ignoring Plaintiff's applications and protests, has demonstrated that it intends to maintain said basis.

XIII.

By maintaining its present order, the respondent Commission has knowingly maintained illegal orders, which has resulted in many operators obtaining more than their fair share of the oil, for which no penalty can be imposed, and all of which has resulted in the drainage of complainant's property and has resulted in discrimination in that complainant has attempted to abide by the law and the orders of the Commission.

XIV.

Unless said order is declared null and void, complainant fears that it will be sued by its° royalty owners for damages and for forfeiture of its lease, because the present disparity in development and allowable production will result in an allegation and contention that complainant has failed to properly develop and produce its lease, all of which is due to said order of the respondent Commission.

XV.

The value of the amount of oil which has already been wrongfully drained from complainant's property is over \$50,000.00, and the value of the oil which is migrating from complainant's lease and which will continue to migrate by reason of the maintenance of said order, is far in excess of \$60,000.00.

XVI.

If any of the laws of this State authorize or justify the order complained of herein, said law or laws are invalid and unconstitutional for the same reasons given for the attack upon the order herein complained of. Complainant does not complain of the law under which said order was enacted, other than as is herein specifically set forth; but, on the contrary, has always been a staunch and ardent supporter of the theory and practice of proration in the orderly production of oil, and has employed counsel and witnesses to appear before the Commission at its various hearings to insist upon the promulgation of a fair and equitable distribution of the allowable, but Respondent Commission has ignored its efforts and pleas in the premises, and Respondents have arbitrarily and with wanton disregard of the rights of Complainant, entered and promulgated orders which are arbitrary, unreasonable, and confiscatory.

XVII.

By reason of the allegations hereinbefore set forth, Complainant has in the past and will in the future continue to suffer irreparable loss and injury, and by reason of the allegations hereinbefore set forth, is without adequate remedy at law.

Premises considered, Complainant prays:

(1) That upon a hearing, after due notice, a preliminary injunction issue out of this Court enjoining the Respondents, their successors, and their representatives, agents, servants and employees, from attempting to enforce against the Complainant in the conduct of its producing operations upon its properties in the East Texas Field hereinbefore mentioned, the orders and rules governing production in said East Texas Field, as set forth in Exhibit C, adopted by the Commission on August 29, 1938, and from enforcing against Complainant any of the terms and provisions of said rules and orders, as well as all renewal or extension orders, and as well as any and all similar monthly proration orders and schedules for the East Texas Field; and further enjoining the Railroad Commission from enforcing against the Complainant any rules and orders governing and providing for the prorating of oil in the East Texas Field that deny the Complainant a right to produce that proportion of the total daily allowable that the recoverable oil under its lease bears to the total recoverable oil in the East Texas Field; and further enjoining Respondents from interfering, in any way, with the pipe line company transporting the oil so produced.

(2) That a three Judge specially constituted District Court be assembled pursuant to Section 266, Judicial Code, as amended, for the purpose of hearing and determining Complainant's motion herein for interlocutory injunction; and for the purpose of conducting the final trial herein.

(3) That upon a final hearing the preliminary injunction as prayed for herein be made permanent, and that a decree be entered herein decreeing and adjudging invalid the aforesaid orders and rules of the Railroad Commission as well as all renewal and extension orders, or rules, substantially enforcing or continuing in effect the aforesaid rules on any schedule or orders that may be promulgated by the Commission following its monthly hearing extending and enforcing in principle the above described orders and schedules as they apply to Complainant; that said orders and schedules, and each of them, as they affect Complainant, be set aside, vacated and annulled; and that the Respondents and their successors, representatives, agents, servants and employees be permanently enjoined from enforcing said orders, rules, schedules, and any renewals or extensions thereof, against the Complainant and from taking any steps whatsoever, directly or indirectly, restricting Complainant's right to produce and secure the transportation of that proportion of the total daily recoverable oil that the recoverable oil under its lease bears to the total recoverable oil in the East Texas Field.

(4) If the Court should be unwilling to grant at this time the permanent relief prayed for in the absence of positive action by the Railroad Commission specifically refusing or otherwise in terms disposing of the complaint presented by the Complainant to the Railroad Commission on March 4, 1938, as hereinbefore alleged, then in such contingency and in the alternative Complainant prays for the temporary relief as prayed for in paragraph (1) of the foregoing prayer and also for final relief in the nature of a permanent or perpetual
 16 injunction to be in force at least until the Commission shall have set aside and vacated the rules and orders herein complained of until the Commission shall have substantially granted the relief or

removed the injuries herein complained of; and that such injunction herein prayed for shall remain in force so long as the Complainant is subjected to the confiscation of its properties and the injuries complained of herein by the enforcement against the Complainant of the aforesaid arbitrary rules and orders in the manner hereinabove set forth.

(5) For judgment against the Respondents for costs of suit and for such other and further relief as the evidence shall justify and as to the Court shall seem equitable in the premises.

DAN MOODY,
RICE M. TILLEY,
PHILLIP TOCKER.

Fort Worth, Texas.

State of Texas,
County of Travis.

Before me, the undersigned authority, on this day personally appeared Phillip Tocker, who on his oath says that he is one of the attorneys for Complainant in the above styled and numbered cause; that he is acquainted with the facts set out in the foregoing petition, knows them to be true, and is authorized to make this affidavit on behalf of said Complainant, Rowan and Nichols Oil Company, and upon his oath says that the facts set out in such petition are true.

PHILLIP TOCKER.

Subscribed and sworn to before me this the 7th day of September, A. D. 1938.

CORNELIA GEORGE,
Notary Public in and for
Travis County, Texas.

(Seal)

OIL AND GAS LEASE

AGREEMENT Made and entered into the

29th

day of

July

1938

by and between **B.C. Todd of Longview, Texas, C.F. Todd and B. M. Todd, of Dallas, Texas, and J.W. Todd, of Oklahoma City, Okla., Mrs. Cora L. Todd, L. J. Jellin, Jr., Frank Buttram, O. M. Boren, Premier Royalty Company, Inc., and R. B. Ramey, Jr.** hereinafter called **lessor** (one or more), and **Rowan & Niebold Oil Company, a Texas corporation of Ft. Worth, Texas** hereinafter called **lessee**

WITNESSETH That the said lessor, for and in consideration of **TWENTY FIVE (\$25,000.00) THOUSAND DOLLARS**

cash in hand paid, receipt of which is hereby acknowledged, and of the covenants and agreements hereinafter contained on the part of lessee to be paid, kept and performed, has granted, demised, leased, and let and by these presents does grant, demise, lease and let unto the said lessor, for the sole and only purpose of mining and operating for oil and gas, and laying pipe lines, and building tanks, power stations and structures thereon to produce, save and take care of said products, all that certain tract of land situated in the County of **Gregg** State of Texas, described as follows, to-wit:

A tract of land in Gregg County, Texas, part of the Wm. H. Castleberry League and Labor Survey; BEGINNING at an old pine knot stake on the W.B.L. of said Castleberry Survey, which is the S.W. corner of the tract owned by the Todd Estate; Thence N 1 deg 05' E with the Castleberry line, 586 feet to the SW corner of a 40 acre lease of said Todd land owned by the Continental Oil Co; THENCE N 88 deg. 30' E with said Continental South line, 1867 ft. to the SE cor. of said 40 acres on the E.B.L. of said Todd tract; THENCE S 0 deg. 25' E with said line 418 ft. to an iron pipe at the S. W. cor. of the Stephens tract; THENCE S. 88 deg. 43' W 65 ft. to the corner of the Todd wire fence, a pine in said corner of fence; THENCE in a S.W. direction approximately 182 ft. to a point in road; THENCE S 88 deg. 54' W. along road and lane and continuing to point in the Castleberry league line, same being the S.W. corner of the Todd tract; a distance of 1775 feet, containing in all 25-acres of land, more or less.

and containing **twenty five**

acres, more or less.

It is agreed that this lease shall remain in force for a term of **ten** years from date, and as long thereafter as oil or gas, or either of them, is produced from said land by the lessee.

In consideration of the premises the said lessee covenants and agrees:

- 1st To deliver to the credit of lessor, free of cost, in the pipe line to which lessee may connect his wells, the equal one-eighth part of all oil produced and saved from the leased premises.
- 2nd To pay to lessor as royalty for gas from each well where gas only is found, while the same is being sold or used off of the premises, one-eighth of the market price at the wells of the amount so sold or used, the lessor to have gas free of charge from any gas well on the leased premises for all above and inside lights in the principal dwelling house on said land by making lessor's own connections with the well at lessor's own risk and expense.
- 3rd To pay to lessor as royalty for gas produced from any oil well and used by lessee for the manufacture of gasoline, one-eighth of the market value of such gas. If such gas is sold by lessee, then lessee agrees to pay lessor, as royalty, one-eighth of the market price at the wells of the amount sold.

If no well be commenced on said land on or before the **29th** day of **July**, 1938 this lease shall terminate as to both parties, unless the lessee on or before that date shall pay or tender to the lessor or to the lessor's credit in the **FIRST NATIONAL** Bank at **Longview, Texas**, or its successors, which shall continue as the depository regardless of changes in the ownership of said land, the sum of **twenty five** - - - - - and no/100 - - - - -

DOLLARS, which shall operate as a rental and cover the privilege of deferring the commencement of a well for **twelve** months from said date. In like manner, and upon like payments or tenders the commencement of a well may be further deferred for like periods of the same number of months successively. And it is understood and agreed that the consideration first recited herein the down payment, covers not only the privilege granted to the date when said rental is payable as aforesaid, but also the lessee's option of extending that period as aforesaid and any and all other rights conferred.

Should the first well drilled on the above described land be a dry hole, then, and in that event, if a second well is not commenced on said land within twelve months from the expiration of the last rental period, which rental has been paid, this lease shall terminate as to both parties, unless the lessee on or before the expiration of the last twelve months shall resume the payment of rentals in the same amount and in the same manner as hereinbefore provided. And it is agreed that upon the resumption of the payment of rentals, as above provided, that the last preceding paragraph hereof, governing the payment of rentals and the effect thereof, shall continue in force just as though there had been no interruption in the rental payments.

If, at the expiration of **ten** years from the date of this lease, oil or gas is not being produced on the leased premises, but lessee is then engaged in drilling for oil or gas, then this lease shall continue in force so long as drilling operations are being continuously prosecuted on the leased premises, and drilling operations shall be considered to be continuously prosecuted if not more than sixty (60) days shall elapse between the completion or abandonment of one well and the beginning of operations for the drilling of a subsequent well. If oil or gas

shall be discovered and produced in paying quantities from any such well or wells drilled at or after the lapse of **ten** years, this lease shall continue in force so long as oil or gas shall be produced from the leased premises.

It is specially agreed that in the event that oil or gas is produced from said premises and said production shall for any reason cease or terminate, lessee shall have the right at any time within ninety (90) days from the cessation of such production to resume drilling operations in the effort to make said leased premises again produce oil or gas, in which event this lease shall remain in force so long as such operations are continuously prosecuted, as defined in the preceding paragraph, and if they result in production of oil or gas, so long thereafter as oil or gas is produced in paying quantities from the premises.

If said lessor owns a less interest in the above described land than the entire and undivided fee simple estate therein, then the royalties and rentals herein provided for shall be paid the said lessor only in proportion which lessor's interest bears to the whole and undivided fee.

Lessee shall have the right to use, free of cost, gas, oil and water produced on said land for all operations thereon, except from water wells of lessor. When requested by lessor, lessee shall bury its pipe line below plow depth. No well shall be drilled nearer than 100 feet to the house or barn now on said premises without the written consent of the lessor. Lessee shall pay for damages caused by all operations to growing crops on said land. Lessee shall have the right at any time to remove all machinery and fixtures placed on said premises, including the right to draw and remove casing.

If the estate of either party hereto is assigned, and the privilege of assigning in whole or in part is expressly allowed, the covenants hereof shall extend to their heirs, executors, administrators, successors or assigns, but no change in the ownership of the land or assignment of rentals or royalties shall be binding on the lessee until after the lessee has been furnished with a written transfer or assignment or a true copy thereof; and it is hereby agreed in the event this lease shall be assigned as to a part or parts of the above described lands and the

It is agreed that this lease shall remain in force for a term of **ten** years from date, and as long thereafter as oil or gas, or either of them, is produced from said land by the lessee.

In consideration of the premises the said lessee covenants and agrees:

1st To deliver to the credit of lessor, free of cost, in the pipe line to which lessee may connect his wells, the equal one-eighth part of all oil produced and saved from the leased premises.

2nd To pay to lessor as royalty for gas from each well where gas only is found, while the same is being sold or used off of the premises, one-eighth of the market price at the wells of the amount so sold or used, the lessor to have gas free of charge from any gas well on the leased premises for all pipes and inside rights in the principal dwelling house on said land by making lessor's own connections with the well at lessor's own risk and expense.

3rd To pay to lessor as royalty for gas produced from any oil well and used by lessee for the manufacture of gasoline, one-eighth of the market value of such gas. If such gas is sold by lessee, then lessee agrees to pay lessor, as royalty, one-eighth of the market price at the wells of the amount sold.

If no well be commenced on said land on or before the **30th** day of **July**, 193 **8** this lease shall terminate as to both parties, unless the lessee on or before that date shall pay or tender to the lessor or to the lessor's credit in the **FIRST NATIONAL** Bank at **Longview, Texas** or its successors, which shall continue as the depository regardless of change in the ownership of said land, the sum of **twenty five - - - - - and no/100 - - -**

DOLLARS which shall operate as a rental and cover the privilege of deferring the commencement of a well for **twelve** months from said date. In like manner and upon like payments or tenders the commencement of a well may be further deferred for like periods of the same number of months successively. And it is understood and agreed that the consideration first recited herein, the down payment, covers not only the privilege granted to the date when said rental is payable as aforesaid, but also the lessee's option of extending that period as aforesaid and any and all other rights conferred.

Should the first well drilled on the above described land be a dry hole, then, and in that event, if a second well is not commenced on said land within twelve months from the expiration of the last rental period which rental has been paid, this lease shall terminate as to both parties, unless the lessee on or before the expiration of said twelve months shall resume the payment of rentals in the same amount and in the same manner as hereinbefore provided. And it is agreed that upon the resumption of the payment of rentals, as above provided, that the last preceding paragraph herofore governing the payment of rentals and the effect thereof, shall continue in force just as though there had been no interruption in the rental payments.

If, at the expiration of **ten** years from the date of this lease, oil or gas is not being produced on the leased premises, but lessee is then engaged in drilling for oil or gas, then this lease shall continue in force so long as drilling operations are being continuously prosecuted on the leased premises, and drilling operations shall be considered to be continuously prosecuted if not more than sixty (60) days shall elapse between the completion or abandonment of one well and the beginning of operations for the drilling of a subsequent well. If oil or gas

shall be discovered and produced in paying quantities from any such well or wells drilled or being drilled at or after the lapse of **ten** years, this lease shall continue in force so long as oil or gas shall be produced from the leased premises.

It is specially agreed that in the event that oil or gas is produced from said premises and said production shall for any reason cease or terminate, lessee shall have the right at any time within ninety (90) days from the cessation of such production to resume drilling operations in the effort to make said leased premises again produce oil or gas, in which event this lease shall remain in force so long as such operations are continuously prosecuted, as defined in the preceding paragraph, and if they result in production of oil or gas, so long thereafter as oil or gas is produced in paying quantities from the premises.

If said lessor owns a less interest in the above described land than the entire and undivided fee simple estate therein, then the royalties and rentals herein provided for shall be paid the said lessor only in proportion which lessor's interest bears to the whole and undivided fee.

Lessee shall have the right to use, free of cost, gas, oil and water produced on said land for all operations thereon, except from water wells of lessor. When requested by lessor, lessee shall bury its pipe line below plow depth. No well shall be drilled nearer than 200 feet to the house or barn now on said premises without the written consent of the lessor. Lessee shall pay for damages caused by all operations to growing crops on said land. Lessee shall have the right at any time to remove all machinery and fixtures placed on said premises, including the right to draw and remove casing.

If the estate of either party hereto is assigned, and the privilege of assigning in whole or in part is expressly allowed, the covenants herofore shall extend to their heirs, executors, administrators, successors or assigns, but no change in the ownership of the land or assignment, of rentals or royalties shall be binding on the lessee until after the lessee has been furnished with a written transfer or assignment or a true copy thereof; and it is hereby agreed in the event this lease shall be assigned as to a part or parts of the above described lands and the assignee or assignees of such part or parts shall fail or make default in the payment of the proportionate part of the rents due from him or them, such default shall not operate to defeat or affect this lease in so far as it covers a part or parts of said lands upon which the said lessee or any assignee thereof shall make due payment of said rental.

Lessee shall have the exclusive right to build, operate and maintain gas pipelines, picking stations and plants for the purpose of putting up and marketing the gas from the leased premises and within the land embraced in this lease, whether said oil is produced from lands covered by this lease or other lands and lessor shall be entitled to receive the royalty hereinbefore reserved on all such oil so saved.

In case of cancellation or termination of this lease for any cause, lessee shall have the right to retain under the terms hereof twenty (20) acres of land around each oil or gas well producing, being worked on, or drilling hereunder (as long as such operations are continued in good faith) such tract to be designated by lessee in as near a square form as practicable.

In the event lessor considers that lessee has not complied with all its obligations hereunder, both express and implied, before production has been secured or after production has been secured, lessor shall notify lessee in writing, setting out specifically in what respects lessee has breached this contract. Lessee shall then have sixty (60) days after receipt of said notice within which to meet or commence to meet all or any part of the breaches alleged by lessor. The service of said notice shall be precedent to the bringing of any action by lessor on said lease for any cause, and no such action shall be brought until the lapse of sixty (60) days after service of such notice on lessee. Neither the service of said notice nor the doing of any acts by lessee aimed to meet all or any of the alleged breaches shall be deemed an admission or prescription that lessee has failed to perform all its obligations hereunder.

Title to the minerals vested in grantee under this grant shall not end or revert to grantor until there is a complete, absolute and intentional abandonment by grantee of each and all of the purposes, expressed or implied, of this grant and every part and parcel of the premises described in this grant.

Lessor hereby warrants and agrees to defend the title to the lands herein described, and agrees that the lessee shall have the right at any time to redeem for lessor, by payment, any mortgage, taxes or other liens on the above described lands, in the event of default of payment by lessor, and be subrogated to the rights of the holder thereof, and lessor hereby agrees that any such payment made by the lessee for the lessor shall be deducted from any amounts of money which may become due the lessor under the terms of this lease.

In Testimony Whereof, We have this the

day of

Wm. B. Rutledge
B. J. Todd
Core E. Todd
BY *B. J. Todd* V. PRES.

ATTEST
CLERK

JOINT ACKNOWLEDGMENT

THE STATE OF TEXAS,

COUNTY OF Gregg

BEFORE ME, the undersigned, a Notary Public in and for said County and State on this day personally appeared

B. C. Todd

and

Cora L. Todd

his wife, both

known to me to be the persons whose names are subscribed to the foregoing instrument, and acknowledged to me that they each executed the same for the purposes and consideration therein expressed, and the said

Cora L. Todd

wife of the said

B. C. Todd

having been examined by me privily and apart from her husband, and having the same fully explained to her, she, the said Cora L. Todd acknowledged such instrument to be her act and deed, and she declared that she had willingly signed the same for the purposes and consideration therein expressed, and that she did not wish to retract it.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the 4th day of September A. D. 1931

(L.S.)

Notary Public in and for

Gregg

County, Texas

645—The Odco Company, Publishers—Dallas

going instrument, and having been examined by me privily and apart from her husband, and having the same fully explained to her, she, the said Cora L. Todd acknowledged such instrument to be her act and deed, and she declared that she had willingly signed the same for the purposes and consideration therein expressed, and that she did not wish to retract it.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the day of A. D. 19

(L.S.)

Notary Public in and for

County, Texas

THE STATE OF TEXAS,

COUNTY OF Salt

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared

B. C. Todd

known to me to be the person whose name subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed, and

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the 17 day of August A. D. 1931

(L.S.)

Notary Public in and for

County, Texas

COUNTY CLERK, GREGG COUNTY, TEXAS

Deputy

Given under my hand and Seal of Office in Longview, Texas, this day of 1931

572-5-5 in volume 38 record of DEEDS
 (Certificate of Authentication was on this day, correctly recorded on pages
 day of 1931, and that the same registered

of Gregg County, Texas

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared

W. J. Todd

known to me to be the person whose name ~~was~~ subscribed to the foregoing instrument, and acknowledged to me that ~~he~~ executed the same for the purposes and consideration therein expressed, ~~and~~

said

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the

17 day of August A.D. 1931

(L.S.)

Notary Public in and for

Palmer

County, Texas.

COUNTY CLERK, GREGG COUNTY, TEXAS

Deputy

Given under my hand and Seal of Office in Longview, Texas, this day of *August* 1931

of Gregg County, Texas

I hereby certify that the foregoing deed or instrument of writing was filed in my office for record at *2:05* o'clock *P.* M., on the *19th* day of *August*, 1931, and that the same together with the certificate of Authentication was on this day, correctly recorded on pages *562-563* in volume *58* of record of DEEDS.

THE STATE OF TEXAS,
COUNTY OF GREGG.

40-REVISED
Texas Standard Form

No. 20612

Oil and Gas Lease

FROM

TO

JAMES MICHAEL OIL COMPANY

Dated July 29th, 1931

No. Acres - - - 25

Gregg County, Texas

Term ten years.

This instrument was filed for record on the

3 day of *Oct* 1931, at *2:05* o'clock *P.* M., and duly

recorded in Book *58*, Page *562-563*

records of *Dutch Street* of this office

County Clerk

County, Texas.

By *W. J. Todd* Deputy

When recorded return to

James Michael Oil Co., Inc.,
200 Citizens Bank Bldg.,

Tyler, Texas.

The Otter Company, Publishers, Dallas

OKLAHOMA SINGLE ACKNOWLEDGMENT
THE STATE OF ~~OKLAHOMA~~
COUNTY OF Oklahoma

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared

----- Frank Buttram -----

known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the 14 day of September, A. D. 1931.

(L.S.)
*My commission expires
on the 25th of September 1934*
Sept 25 1934

John G. Chad
Notary Public in and for - Oklahoma - - - County, Texas
Okla. 14

SINGLE ACKNOWLEDGMENT

THE STATE OF TEXAS,
COUNTY OF SMITH.

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared

----- L.A. Grelling, Jr., O.M. Boren, and T.B. Ramey, Jr. -----

known to me to be the person whose name are subscribed to the foregoing instrument, and acknowledged to me that they executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the 4th. day of September, A. D. 1931.

(L.S.)

M. Norman
Notary Public in and for - - Smith - - - - - County, Texas

642—The Office Company, Publishers—Dallas

THE STATE OF ~~TEXAS~~

COUNTY OF ~~SMITH~~

SINGLE ACKNOWLEDGMENT

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared

~~my commission expires~~
~~on the 25th day of September 1931~~
Sept 25 1931

Notary Public in and for - Oklahoma - - - ~~County~~ ~~Okla.~~

14

SINGLE ACKNOWLEDGMENT

THE STATE OF TEXAS,

COUNTY OF SMITH.

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared

- - - - - L.A. Grelling, Jr. O.M. Boren, and T.B. Ramey, Jr. - - - - -

known to me to be the person ^B whose name are subscribed to the foregoing instrument, and acknowledged to me that they executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the 4th. day of September, A. D. 1931.

(L.S.)

Wm Norman

Notary Public in and for - - Smith - - - - - County, Texas.

243—The Odco Company, Publishers—Dallas

21

SINGLE ACKNOWLEDGMENT

THE STATE OF ~~TEXAS~~

COUNTY OF ~~Smith~~

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared

J. W. Todd

known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the 15 day of August, A. D. 1931

(L.S.)

E. H. Bramlett

Notary Public in and for ~~Smith~~ *Wm* County, ~~Texas~~

243—The Odco Company, Publishers—Dallas

2400 31

SINGLE ACKNOWLEDGMENT

THE STATE OF TEXAS,
COUNTY OF DALLAS

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared

B. L. TODD

known to me to be the person whose name 1st subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the 1st day of July, A. D. 1951

(L.S.)

Notary Public in and for Dallas County, Texas

612—The Oden Company, Publishers—Dallas

CORPORATION ACKNOWLEDGMENT

The State of Texas

County of Kaufman

Before me, the undersigned authority

Notary Public

of

Kaufman

County, Texas, on this day personally appeared

B. A. Showers, Vice-President

of

Premier Royalty Company, Inc.,

known to me to be the person and officer whose name is subscribed to the foregoing instrument and acknowledged to me that the same was the act of the said Premier Royalty Company, Inc., a corporation, and that he executed the same as the act of such corporation for the purpose and consideration therein expressed, and in the capacity therein stated.

Given under my hand and seal of office this

2nd

day of

September

A. D. 1951

Notary Public

Kaufman

County, Texas

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EXHIBIT B.

Railroad Commission of Texas.
Oil and Gas Division.

In Re: Conservation and Prevention of Waste of Crude
Petroleum and Natural Gas in the State of Texas.

Oil and Gas Dockets Nos. 108, 120, 123, 124, 125, 126,
128, 129, 132, and 146.

Austin, Texas, May 29, 1934.

Pursuant to notice and hearing Rule No. 37 under Division No. 1, of the amended general conservation rules and regulations of general application in Texas, as promulgated on October 17, 1933, and amended by order promulgated on April 3, 1934, is amended so as hereafter to read as follows:

"Rule 37. Spacing Rule.—No well for oil or gas shall hereafter be drilled nearer than 300 feet to any other completed or drilling well on the same or adjoining tract or farm; and no well shall be drilled nearer than 150 feet to any property line, lease line, or sub-division line; provided that the Commission in order to prevent waste or to prevent the confiscation of property will grant exceptions to permit drilling within shorter distance than above prescribed whenever the Commission shall determine that such exceptions are necessary either to prevent waste or to prevent the confiscation of property. When an exception to such rule is desired, application therefor shall be filed with the Commission fully stating the facts, which application shall be accompanied by a plat drawn to the scale of one inch equalling 400 feet, accurately showing to scale the property on which permit is sought to drill a well under an exception to this rule, and accurately showing to scale all other completed,

drilling and permitted wells on said property; and accurately showing to scale all adjacent surrounding properties and wells. Such application shall be verified by some person acquainted with the facts, stating that all facts therein stated are within the knowledge of the affiant true, and that the accompanying plat is accurately drawn to scale and correctly reflects all pertinent and required data. Such exceptions shall be granted only after at least ten days notice to all adjacent lessees affected thereby has been given, and after public hearing at which all interested parties may appear and be heard, and after the Commission has determined that an exception to such rule is necessary either to prevent waste or to protect the property belonging to applicant from confiscation. All pending applications shall be amended to conform to this rule before being acted upon. Upon similar application and showing the Commission may grant exceptions to the application of this rule in fields where the production is obtained from a formation which is known to be segmented by piercement of intrusive salt plugs.

"In the interest of protecting life and property and for other just and reasonable causes the Commission reserves the right in particular fields to enter special orders increasing the minimum distances provided by this rule.

"No well drilled in violation of this rule without special permit obtained in the manner prescribed in said rule and no well drilled under such a special permit, which does not conform to the terms of such special permit in all respects shall be permitted to produce either oil or gas and any such well so drilled in violation of said rule or in violation of a permit granted under an exception to such rule shall be plugged."

In applying this rule the general order of the Commission with relation to sub-divisions of properties shall be observed.

RAILROAD COMMISSION OF
TEXAS,

By LON A. SMITH,

Chairman,

C. V. TERRELL,

Commissioner,

ERNEST O. THOMPSON

Commissioner.

Attest:

C. F. PETET,
Secretary.

(Seal)

jhi

22

EXHIBIT-B-2.

Railroad Commission of Texas.
Oil and Gas Division.

In Re: Conservation and Prevention of Waste of Crude
Oil and Natural Gas in the East Texas Field.

Oil and Gas Docket No. 120.

Austin, Texas, May 29, 1934.

Pursuant to notice and hearing in the adoption and amendment of rules and regulations by the Railroad Commission of Texas governing the conservation of crude oil and natural gas and the prevention of waste thereof, and in the light of evidence heretofore introduced at hearings held pursuant to such notices:

It Is Hereby Ordered by the Railroad Commission of Texas that Rule No. 1 of Sub-division II (Drilling) of Division 3, being special rules governing the East Texas Field, is hereby amended so as hereafter to read as follows:

Rule 1. Spacing Rule. No well for oil or gas shall hereafter be drilled in said East Texas Field nearer than 660 feet to any other completed or drilling well on the same or adjacent tract or farm, and no well shall be drilled in said field nearer than 330 feet to any property line, lease line or subdivision line; provided that the Commission in order to prevent waste, or to prevent the confiscation of property will grant exceptions to permit drilling within shorter distances than above prescribed whenever the Commission shall determine that such exceptions are necessary either to prevent waste or to prevent the confiscation of property. When an exception to such rule is desired application therefor shall be filed with the Commission fully stating the facts, which application shall be accompanied by a plat drawn to the scale of one inch equalling four hundred feet, accurately showing to scale the property on which permit is sought to drill a well under an exception to this rule, and accurately showing to scale all other completed, drilling, and permitted wells on said property; and accurately showing to scale all adjacent surrounding properties and wells. Such application shall be verified by some person acquainted with the facts, stating that all facts therein stated are within the knowledge of the affiant true, and that the accompanying plat is accurately drawn to scale and correctly reflects all pertinent and required data. Such exception shall be granted only after at least ten days notice to all adjacent lessees affected thereby has been given, and after public hearing at which all interested parties may appear and be heard, and after the Commission has determined that an exception to such rule is necessary either to prevent waste or to protect the property belonging to applicant from confiscation. All pending applications shall be amended to conform to this rule before being acted upon.

No well drilled in violation of this rule without special permit obtained in the manner prescribed in said

rule, and no well drilled under such a special permit which does not conform in all respects to the terms of such permit, shall be permitted to produce either oil or gas; and any such well so drilled in violation of said rule or in violation of a permit granted as a special exception to said rule shall be plugged.

The order entered by this Commission on August 30, 1933; commonly designated as the direct and equidistant offset order is hereby rescinded, annulled and shall be of no further force and effect. All other rules, regulations and orders of this Commission which conflict with the terms and provisions of Rule No. 1 as hereby amended and promulgated are hereby declared to have no further application to wells in said East Texas Field to the extent of such conflict.

In the adoption and promulgation of this order it is here declared that the Commission intends to adopt each phrase, sentence, and paragraph separately and independently of each other such phrase, sentence, and paragraph, and if any portion of this order or any portion of the rule hereby adopted shall be declared invalid, such declaration and such invalidity shall not affect any other portion.

RAILROAD COMMISSION OF
TEXAS,

By LON A. SMITH,

Chairman,

C. V. TERRELL,

Commissioner,

ERNEST O. THOMPSON,

Commissioner.

Attest:

C. F. PETET,

Secretary.

(Seal)

b/

EXHIBIT C.

Railroad Commission of Texas.
Oil and Gas Division.

In Re: Conservation and Prevention of Waste of Crude
Petroleum and Natural Gas in the State of Texas.

Oil and Gas Docket Nos. 108, 120, 123, 124, 125, 126, 128,
129, 132 & 146.

#20 - 397.

Austin, Texas, August 29, 1938.

Special Order Fixing the Allowable Production of Crude
Oil in the Various Fields and Districts in Texas.

Whereas, after due notice, hearings have been held in Austin, Texas, at various times, including the hearing on August 19, 1938, with respect to the existence and imminence of waste of oil and gas in the State of Texas, and the prevention thereof; and

Whereas, in view of the evidence, including among other matters the physical conditions in the various fields, the transportation and marketing facilities, the reasonable market demand, the reasonableness of the allocation as between fields of the allowable production under previous orders; and

Whereas, The Railroad Commission of Texas finds from the evidence that the reasonable market demand for oil produced in this State from the various fields and districts therein equals the amount hereinafter shown as the allowable production thereof during the period beginning at 7 o'clock a. m., September 1, 1938, and until further ordered; and

Whereas, The Railroad Commission of Texas finds that waste exists and is imminent and that to prevent such waste of oil and gas as the same is defined by the applicable Statutes, it is necessary to restrict the production of oil in the State of Texas to the reasonable market demand:

Therefore, it is Ordered that beginning at 7 o'clock a. m., September 1, 1938, and until further ordered, the production of oil in the State of Texas and the various fields shown, shall be as hereinafter shown Except as provided for in the Commission's order of August 29, 1938, entitled "General Order" Shutting Down All Oil Wells in the Various Fields and Districts in the State of Texas on September 3rd, 4th, 10th, 11th, 17th, 18th, 24th and 25th.

Rule 2 of Division 2, as contained in an order of this Commission dated October 17, 1933, pertaining to the Panhandle District of Texas is hereby re-adopted and amended as follows:

Rule 2: Not more than Eighty Thousand Seven Hundred Sixty-three (80,763) barrels of crude oil shall be produced from said district during any day of the effective period of this Order. Moore County shall not produce in excess of One Thousand Five Hundred Twenty-nine (1529) barrels daily. Moore County allowable is in addition to Panhandle allowable. The Osborne Area in Wheeler County shall not produce in excess of Six Hundred Twenty (620) barrels of crude oil daily. The Osborne Area allowable is in addition to the Panhandle allowable.

2. Rule 23 (a) of Division 3, as contained in an order of this Commission dated October 17, 1933, pertaining to the East Texas Field is hereby re-adopted and amended as follows:

24 Whereas, The Railroad Commission of Texas finds from evidence submitted to it at a hearing held in Austin on August 19, 1938, and at previous hearings held before the regulatory body that the reservoir of the East Texas Field has its energy supplied by a hydrostatic drive which encroaches from the west to the east, and only a certain amount of crude oil can be withdrawn daily from the East Texas Reservoir in order to utilize to the greatest extent the energy necessary for the production and recovery of the greatest amount of oil ultimately from the reservoir. It has been recommended to the Commission by competent engineers that not more than 425,000 to 450,000 barrels of crude oil should be allowed to be produced from the East Texas Reservoir in any one day in order that the reservoir might be depleted with the least possible amount of waste incurring. Evidence has also been submitted to the Commission at these hearings that the production of from 425,000 to 450,000 barrels of crude oil will prohibit the coning of water, the uneven encroachment of water, and the subsequent trapping of much oil with otherwise, under higher daily allowables of crude oil, would not be recovered.

Rule 23 (a). Therefore, it is Further Ordered by the Railroad Commission of Texas that during each twenty-four (24) hour period beginning at 7 o'clock a. m., Central Standard Time, September 1, 1938, the owner or operator or manager of each well in the East Texas Field shall be permitted either collectively or individually, to produce daily from each well a maximum of Two and Thirty-two Hundredths (2.32%) Per Cent of its hourly potential capacity as determined by the Commission.

3. Rule 2 of Division 5, as contained in an Order of this Commission dated October 17, 1933, pertaining to the North Texas District, is hereby re-adopted and amended as follows:

Rule 2. Not more than Eighty-eight Thousand and Eight (88,008) barrels of crude oil shall be produced from said district during any day of the effective period of this order, which is distributed in the following manner:

North Texas Proper, Anderson - Kerr, 65,747.

Gant Pool, 340.

Foard County, 688.

K. M. A., 21,233.

4. Rule 2 of Division 6, as contained in an order of this Commission dated October 17, 1933, pertaining to the West Central Texas District is hereby re-adopted and amended as follows:

Rule 2. Not more than Seventy-nine Thousand and Sixty-seven (79,067) barrels of crude oil shall be produced from said district during any day of the effective period of this order, which is distributed to the various counties as follows:

Brown	2086	Jones	7264
Callahan	1450	McCullough	25
Coleman	1217	Palo Pinto	370
Comanche	79	Reagan (Big Lake) ...	7500
Crockett (Crockett) ...	266	Reagan (Grayson) ...	151
Crockett (Todd)	0	Runnels	147
Crockett (Simpson) ...	50	Shackelford	7396
Crockett (World)	1047	Stephens	4393
Eastland	2973	Stonewall	100
Erath	76	Taylor	74
Irion	40	Throckmorton	399
Fisher	4215	Upton (McCamey) ...	19662
Haskell	227	Upton (Herrington Ex-	
Hurdle	245	tension)	196
Jack (So. Half)	9939	Webb Ray	79
		Young (So. Half)	7401

Rule 4 of Division 7, as contained in an order of the Commission dated October 17, 1933, pertaining to the West Texas District is hereby readopted and amended as follows:

Rule 4. Not more than Two Hundred Twenty Three Thousand Five Seventy Eight (223,578) barrels of crude oil per day shall be produced from said district during any day of the effective period of this Order, which shall be distributed to the various fields therein as follows:

Bashara	176	McClintic	1211
Bennett	2978	Monroe	24
Carter	20	Moore	80
Church Fields	6633	Netterville	378
Cowden, North	8735	Northwest	39
Cowden, South	347	Parker	33
Cowden, Crane	2357	Payton	1216
Dean	80	Pecos Valley	993
Deep Rock	236	Penwell	4710
Dobbs	9	Richards	0
Duggan	518	Sand Hills (Permian)	1293
Edwards	10	Sand Hills (Ordovic-	
Emperor	1558	ian)	260
Estes	8510	Scanlan	0
Eaves	371	Scarborough	2075
Foster	6526	Sealey	503
Fuhrman	1554	Seminole	511
Garza County	41	Shearer	98
Goldsmith	21812	Shipley	1688
Gulf-McElroy	4422	Slaughter	683
Hall	559	Snyder	1486
Harper	11954	Taylor Link	1300
Hendricks	12000	Tobarg	2048
Henderson	3500	Waddell	1469
Howard-Glasscock	17773	Ward, North	6706

Iatan-E. Howard	7807	Ward, Sough	12320
Johnson	43	Wasson	7828
Jordan	2586	West	60
Kermit	20074	Westbrook	922
Keystone	3365	Wheat	1527
Leck	340	White-Baker	0
Mason	395	Wilson	0
Masterson	618	Yates	21072
Means	2988	Yates (Smith Sand)	150

6. Rule 2 of Division 4, as contained in an order of this Commission dated October 17, 1933, pertaining to the East Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than One Hundred Twelve Thousand One Hundred Sixty Three (112,163) barrels of crude oil per day shall be produced from said field in said district during any day of the effective period of this order. Said amounts shall be allocated to the various fields in the following amounts:

Boggy Creek	450	Post Oak	10
Bolivar	28	Powell	2163
Cayuga	11059	Potter	162
Collinsville	10	Percilla	24
Corsicana Shallow	435	Richland	25
Curry	122	Rodessa	31996
Flag Lake	583	Rusk	92
Ginter	50	Sulphur Bluff	6205
Grapeland	100	Shelbyville	30
Huntington	18	South Bosque	18
Lone Star		Talco	33,661
Long Lake	2787	Trinity	757
Lott	70	Van	18725
Mexia	1948	Van Shallow	142
Navarro Crossing	200	Waskom	114
Opelika	30	Wortham	85
Ranola	47	Wortham (Shallow)	12
Pottsboro	5		

7. Rule 2 of Section "A" of Division 8, as contained in an order of this Commission dated October 17, 1933, pertaining to the Southwest Texas District is hereby re-adopted and amended as follows:

Rule 2. Not more than Two Hundred Ninety Two Thousand Eight Hundred Five (292,805) barrels of crude oil shall be produced in said district during any day of the effective period of this order and same shall be distributed as follows:

Division I.

Alta Vista	4	Hantho-Nelson	0
Bateman	135	Hilbig	396
Batesville, New	5	Jacobs	616
Berlin, New	0	Jones	3
Bob Rose	10	Kimbrow	11
Buchanan	240	Larremore	81
Burdett Wells	38	Loma Alto	115
Calliham	215	Lost Mule	0
Carroll	60	Luling Branyon	11857
Carver-Kallison	143	Lytton Springs	342
Cedar Creek	29	Manford	22
Cedar Creek No.	39	Matthews	24
Chapman-Abbott	252	Minerva Rockdale	200
Chicon Lake	21	Noack	89
Clark	145	Pearsall	693
Darst Creek	9011	Salt Flat	5107
Deupree	41	Somerset	674
Dale	171	Southton	64
Dale, West	230	Spiller	64
Dunlap	180	Staples	1
Dunlay	39	Riddle	148
Eckert	159	Taylor Inn	8
Ellison-Young	155	Thrall	39
Ezzell	4507	Von Army	193
Espada Mission	1	Von Army	75
Fairfield	7	Walnut Creek	48
Gas Ridge	8	Zoboroski	137

Division II.

Burnell, South	1099	Mt. Lucas	69
Caesar	324	Normanna	45
Colletto Creek	619	Oakville	138
Cordeil	588	O'Connor McFadden	248
Diamond Half	477	Pettus	835
Dinero	77	Pettus New	1164
Dirks	2679	Placedo	9493
East Telfner	120	Placedo, East	392
Ganado	44	Plummer	286
Greta	8294	Port Lavaca	58
Greta Deep	361	Ray	438
Ieyser	11300	Refugio-Fox	843
Holzmark	34	Refugio-New	3977
Hordes Creek	49	Refugio-Old	1515
Keeran	611	Sarco	0
McMurray	4	Slick	10
McFadden	1568	Tom O'Connor	15538
McNeil	82	Tuleta	502
Mauritz	176	Vanderbilt	73
Mineral	0	Voss	25

Division IV.

Agua Dulce	47	London	75
Albercas	61	Loma Novia	15253
Alfred	278	Lopez	7225
Alice	2058	Los Olmes	125
Alta Mesa	668	Loma Vista	10
Alta Verde	12	Luby	7128
Angelita	21	Lundell	476
Aransas	7429	Midway	1028
Aviators	371	Mirando City	455
Baldwin	472	Mirando Valley	278
Barbacoas	9	Moca	446
Benavides	13665	Nelson	17

Bruni	605	O'Hern	7704
Bruni East	345	Oilton	2867
Captain Lucey	271	Las Animás	75
Carolina-Texas	8	Peters	132
Casa Blanca	611	Piedre Lumbre	1296
Chapman	74	Piedras Pintas	2
Charamousca	342	Plymouth	13305
Charco-Redondo	14	East Premont	264
Clara Driscoll	1523	Premont Prospect	702
Clara Driscoll So.	667	Rancho Solo	16
Cole Middle	20	Randado	327
Cole West	457	Ricaby	7
Colmena	362	Richard King	472
Colorado	319	Rio Grande City	110
Comitas (Haynes)	743	Rincon	98
Corpus Christi	4553	Roma	1
Cuellar	115	Sandia	13
Driscoll	1897	Sarnosa	768
Eagle Hill	424	Sam Fordyce	3566
El Tanque	268	Sam Fordyce North ..	343
Escobas	1418	Saxet	19893
Fitzsimmons	612	Saxet Frio	20647
Flour Bluff	5927	Seven Sisters	8874
Govt. Wells No.	8810	Seven Sisters So.	594
Govt Wells So.	4725	Sinton	8
Henne-Winch-Farris ..	14	Stratton	410
Guerra	837	Sullivan	108
Hoffman	3692	Sweden	286
Jennings	1068	Taft	2766
Killam	1352	Tesoro	196
Kingsville	69	Thomas Lockhart	5
Kohler	114	Turkey Creek	3708
Kehler Deep	51	White Point	28
Labbe	320	White Point East	1960
Laurel	11		

8. Rule 2 of Section A, Division 9, as contained in an Order of the Commission dated October 17, 1933, pertaining to the Gulf Coast District is hereby readopted and amended as follows:

Rule 2. Not more than Two Hundred Fifty Four Thousand Eight Hundred Thirteen (254,813) barrels of crude oil shall be produced from said field of said district during any day of the effective period of this order, which shall be distributed as follows:

Allen Dome	12	Lost Lake	135
Amelia	4399	Louise	1560
Anahuac	9832	Lovell's Lake	127
Ariola	564	Livingston	2362
Armour	167	Magnet	1194
Bammel	98	Manvel Miocene	5884
Barson	1136	Manvel Oligocene	5445
Batson New	1118	Markham	1922
Barbers Hill	10762	Mykawa	200
Bay City	2726	Mykawa New	1447
Big Creek	728	Nash Dome	-0-
Big Hill		Nome	1764
Blue Ridge	802	North Dayton	120
Boling	2010	Old Ocean	5328
Brenham	35	Orange	697
Brookshire	10	Orange West	1080
Buckeye	196	Orchard	350
Call	49	Palacios	120
Cedar Point	457	Pickett Ridge	1620
Cheek	106	Port Neches	1274
Clam Lake	98	Port Neches West	148
Clay Creek	663	Pierce Junction	5216
Cleveland	450	Raccoon Bend	1598
Clintorr	463	Raccoon Bend (Cock-	
Conroe	39368	field)	2460

Cotton Lake	6	Rockland	
Cotton Lake So.	1157	Sandy Point	385
Damon Mound	366	Saratoga	1008
Danbury Dome	588	Satsuma	364
Dickinson	5275	Schwab	78
Esperson Dome	1608	Seabreeze	226
Eureka Heights	1101	Segno	2211
Fairbanks	4131	Segno Deep	150
Fannet	719	Shepherd's Mott ...	-0-
Gillock	3744	Silsbee	2166
Goose Creek	2075	Sour Lake	1491
Greens Lake	19	South Houston	3861
Hamman	1976	South Liberty	673
Hankamer	1328	Spindletop	2926
Hankamer New	264	Sugarland	3994
Hardin	5488	Thompsons	13108
Hardin West		Tomball	8924
Hastings	24333	Turtle Bay	1430
High Island	2690	Webster	3763
Hitchcock	686	West Beaumont	1728
Hull (Old)	3376	West Columbia	2186
Hull (New)	7640	West Columbia New ..	3618
Humble	4362	West Columbia Vicks.	39
Joe's Lake	1070	Wilson	73
Kubela	702	Willow Slough	381
LaBelle	20	Withers	3787
Lochridge	2575		

It is Further Ordered that allowable oil in the foregoing Order is measured on 100 per cent tank tables according to the Pipe Line Rule Number Nine (9), and corrected to sixty (60) degrees Fahrenheit.

It is Further Ordered that this Cause be held open on the Docket for such further orders as may be necessary and supported by evidence of record in the above Cause.

RAILROAD COMMISSION OF
TEXAS,

C. V. TERRELL, Chairman,
ERNEST O. THOMPSON,
Commissioner.

(Seal)

Attest:

C. F. PETET, Secretary.

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EXHIBIT D.

State of Texas,
Railroad Commission of Texas,
Austin.

#6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22,
23, 24, 25 B. C. Todd et al.

Wm. H. Castleberry Survey, Gregg County, Texas.

Case No. 25,545.

Rule 37.

Applicant: Rowan & Nichols, 903 Trinity Life Building,
Fort Worth, Texas.

The application of Rowan & Nichols for an exception under the provisions of Rule 37, coming on to be heard on the 11th day of March, 1938, by the Railroad Commission of Texas, and it appearing that the petition shows good

cause; that no injustice will be done by the granting of such exception, and that same should be granted to prevent confiscation of property:

Now, Therefore, it is Ordered, that the application of Rowan & Nichols for an exception under the provisions of Rule 37 and a permit to drill well No. 6, B. C. Todd et al Lease, containing 25 acres of land out of the Wm. H. Castleberry Survey in Gregg County, Texas, as shown by plat submitted, is hereby approved and applicant is granted permission to drill well No. 6 to be spaced as follows:

As a direct northwest and equidistant offset to R. M. Wood No. 1, fee.

It is Further Ordered that all other requests are hereby denied.

Entered at Austin, Texas, on this the 17th day of March, 1938.

C. V. TERRELL,

Chairman.

LON A. SMITH,

Commissioner.

.....
Commissioner.

Attest:

C. F. PETET,

Secretary.

The above and foregoing is a true and correct copy of an order of the Railroad Commission of Texas, entered on the above date.

LATEN STANBERRY,

Chief Supervisor, Oil and
Gas Division.

em

EXHIBIT E.

Before the Railroad Commission of Texas, Oil & Gas
Division.

In the Matter of: Application of Rowan & Nichols Oil
Company for adjustment in allowable and, alterna-
tively, for twenty permits as exceptions to Rule 37.

No. 25,545 and East Texas Proration Docket No.

Comes now Rowan & Nichols Oil Company, applicant
in the above styled and numbered application, heretofore
filed with the Railroad Commission of Texas on February
24, 1938, and moves that the action of the Railroad Com-
mission of March 17, 1938, in denying applicant's request
for an adjustment in the allowable of what is known as
its Todd "B" lease, consisting of 24.99 acres, Castleberry
Survey, Gregg County, Texas, and denying its alternative
request, in the event said applicant had no lawful right to
an adjustment of allowable, for twenty permits to drill
wells as an exception to Rule 37 on said lease, and the
granting of only its application for Well No. 6 as an equi-
distant offset to the R. M. Wood Well No. 1, Wood Fee,
Castleberry Survey, Gregg County, be set aside and held
for naught, for the following good and sufficient reasons:

I.

Applicant has drilled and is producing five wells on
said lease, in accordance with the rules, regulations and
orders of the Railroad Commission.

II.

Said lease is located in what is known as the Glade-
water Nose and the "fairway," with an average sand

thickness underlying said lease of one hundred (100) feet, and an average potential per well on said lease of 964 barrels, and with a present allowable on said lease for all five wells of 112 barrels per day.

III.

Taking into consideration the elements of porosity, permeability, oil saturation, and thickness of sand underlying said lease, applicant is not receiving and does not have an opportunity equal to other operators and lease owners in the field, to recover its fair share of the oil.

IV.

Applicant is entitled to that proportion of the total daily allowable for the East Texas Field as the recoverable oil under its lease bears to the total recoverable oil in the East Texas Field, but under the present proration orders and the basis therefor, applicant is being deprived of said equal opportunity without due process of law, and is not receiving the equal protection of the laws guaranteed to it by the Constitution and laws of the State of Texas and of the United States.

V.

Applicant can produce from the wells now producing on its lease without waste, that proportion of the total daily allowable that the recoverable oil under its lease bears to the total recoverable oil in the East Texas Field, without the necessity of drilling additional wells.

VI.

The granting of its application for Well No. 6, and the production of oil therefrom, under the present basis of

proration, will continue to deprive and does not grant and and will not guarantee to applicant an equal opportunity to recover its fair share of the oil, and results in the Rail-

road Commission's depriving applicant of produc-
 31 ing per day that proportion of the daily allowable that the total recoverable oil under its lease bears to the total recoverable oil of the East Texas Field, unjustly, inequitably, and contrary to the Constitution and laws of the State of Texas and the United States.

Wherefore, applicant prays that this motion for rehearing be granted, that the order of the Commission heretofore entered on March 17, be set aside and held for naught, and that upon rehearing, the statewide proration order made by said Commission on the 22nd day of March, 1938, on hearing held at Austin on March 19, 1938, be set aside and re-entered or amended so as to give applicant the relief sought at said hearing.

It is also most respectfully urged and prayed that in view of the litigation pending involving, and various claims to, the title to the southern part of applicant's lease and the bona fide title dispute that R. M. Wood claims exists, the Railroad Commission inform this applicant just where the Well No. 6 granted to applicant would be.

Respectfully submitted,

RICE M. TILLEY,

PHILLIP TOCKER,

Attorneys for Applicant,
 Rowan & Nichols Oil
 Company.

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EXHIBIT F.

State of Texas.

Railroad Commission of Texas,
Austin.

Motion for Rehearing by Tilley and Tocker, Attorneys for
Rowan and Nichols Oil Company, Applicant.

Case No. 25,545.

Rule 37.

Applicant: Rowan & Nichols Oil Company, 903 Trinity
Life Building, Fort Worth, Texas.

Motion for rehearing in the above numbered case having this date been considered by the Railroad Commission of Texas, and it appearing that the reasons set out in said motion are sufficient to justify the granting of a rehearing covering the application of Rowan & Nichols Oil Company for an adjustment of allowable or in lieu thereof, special permit to drill wells Nos. 7 to 25 inclusive on the B. C. Todd et al lease, containing 25 acres of land out of the Wm. H. Castleberry Survey in Gregg County, Texas;

Now, therefore, it is Ordered that the motion for rehearing filed by Tilley and Tocker, Attorneys for Rowan & Nichols Oil Company, applicant in the above numbered case, is hereby granted.

Entered at Austin, Texas, on this the 31st day of March,
1938.

C. V. TERRELL,

Chairman.

LON A. SMITH,

Commissioner.

ERNEST O. THOMPSON,

Commissioner.

Attest:

C. F. PETET,

Secretary.

The above and foregoing is a true and correct copy of an order of the Railroad Commission entered on the above date.

LATEN STANBERRY,
Chief Supervisor, Oil and
Gas Division.

em

33 Complainant's Original Bill of Complaint. Filed
7th day of September, 1938, at 3:30 O'Clock P. M.

34 AMENDMENT TO ORIGINAL BILL OF COM-
PLAINT.

(Title Omitted.)

To said Honorable Court:

Comes now Rowan & Nichols Oil Company, complainant in the above styled and numbered cause, leave of Court having first been had, and files this amendment to its original complaint herein and amends Paragraph X thereof by adding at the end thereof Paragraph X-A, as follows:

X-A.

(1) That said present plant of proration based on potential allocates the allowable on a well basis and does not take into consideration the productive capacity of the tract on which the same is located or the well, and said potential factor and basis as now used is unfair and inequitable and does not correctly reflect the thickness and character as to the richness and yield of the underlying sands, the ability of said well or tract to produce, or the recoverable oil underlying any particular tract and/or well, nor the proportionate share of oil that any oper-

ator is entitled to for the following good and sufficient reasons: (a) the amount of oil that an operator recovers depends primarily upon the number of wells he is permitted to drill rather than upon the amount of oil that was originally in place under his land; (b) thus increasing unnecessarily the expense of operation; (c) a potential does not measure the ability of a well to produce ultimately, but only at the time the potential is taken; (d) wells of high productivity obtain invariably a greater proportion of the oil than under unrestricted operating conditions; (e) oil is of necessity measured by units of volume, and potential, therefore, is accurate only if computed on the basis of a potential per acre foot of sand; (f) results obtained by potential tests now made reflect strongly the influence of flow string equipment rather than the desired pay zone conditions; (g) said basis does not take into consideration the amount of pressure being used by various operators to lift the oil; (h) in the purchase and sale of properties in the East Texas oil fields and the taxing of same the acreage factor is of primary importance and consideration, because said property is sold and taxed on a per acre basis, considering improvements thereon; and (i) a potential basis is inaccurate, wasteful and dangerous as a fire hazard.

(2) The operators of more closely drilled tracts should not be given an advantage over operators of less closely drilled tracts in the production of oil because the drilling of a large number of wells on a tract will not increase the total recoverable oil in the field because: (a) the rate of extraction or economical use of the reservoir energy determines the ultimate recovery and not the number of holes in the ground; (b) because in a water driven field such as East Texas proper control of withdrawals make close spacing of little or no importance; (c) because under this theory an operator receives more

oil only because his allowable is not adjusted and not because additional wells increase total ultimate recovery; and (d) because the drilling of such additional wells is not necessary at this time nor has it been in the past, and one well to ten acres will certainly for the
 36 next ten years on the present daily allowable will not require the drilling of more wells, and therefore, said wells are unnecessary wells at this time, and the only purpose in drilling the same is greed on the part of such operator to recover more than his fair share of the oil, more than the recoverable oil underneath his lease, and not for the purpose of recovering oil that would not otherwise be recovered because any such amount of oil, if any there might be that would otherwise be recoverable, would not justify 1/10th the cost of the drilling of such well.

(3) That all wells are allowed to produce 2.32% of their potential except marginal wells, which have a potential of not more than 20 barrels per day, although said so-called marginal wells are located on the poorest and worst part of the structure in said field, are least prolific, generally go on the pump first, have the poorest bottom-hole pressure, sand thickness and are otherwise most unfavorably situated and to permit said wells to produce not less than 20 barrels results in the oil migrating from complainant's lease to said pumping wells, thereby resulting in confiscation of complainant's property and the taking of complainant's oil from its wells, favorably situated as they are on the structure, and giving it to the operators of pumping wells most unfavorably situated by reason of which said marginal well law, and the orders promulgated thereunder are obnoxious and repugnant and in contradiction to the other laws of this State relating to waste and the production of oil and are invalid and unconstitutional because they are discriminatory, capricious, and based upon an arbitrary meas-

ure or basis for allocating the allowable, depriving complainant of its property without due process of law and denying it the equal protection of the law, which said marginal well law was passed at the Regular Session of the Forty-second Legislature, 1931, and which is known as Article 6049-B, Vernon's Annotated Statutes, Chapter 58, Act of the Regular Session, as amended.

37. (4) That if complainant and all others similarly situated were allowed to produce at the rate which complainant contends for, there will not be a rapid drop in the bottom-hole pressure of the East Texas field, and gas will not come out of solution, leaving enormous quantities of oil in the reservoir, because one well will reasonably and adequately drain the oil from ten acres as aforesaid, there are thousands and thousands of wells throughout the field more densely spaced than complainant's, and most of said wells are the second to tenth wells on tracts of less than ten acres owned by one operator on one tract; that not only under the present plan of proration are said wells and operators confiscating the oil, or a large percentage thereof, which complainant is entitled to recover, but said wells and operators are, by said unnecessary and excessive number of wells, using an unnecessary, unfair, inequitable and disproportional amount of the reservoir energy necessary to produce their fair share of the oil, and are thus confiscating and dissipating the reservoir energy which complainant is entitled to, and which will thus be dissipated and exhausted prematurely, forcing complainant to prematurely place its wells on the pump, at great expense, and preventing complainant from ultimately recovering its fair share of the recoverable oil in the time, manner and quantity herein more fully alleged.

(5) That an adjustment in allowable has been sued for before said Commission at numerous hearings as hereinbefore more fully alleged, and all the allegations herein made were made before said Commission, and competent evidence was offered uncontradicted in support thereof. That the said Commission has adopted factors necessary to give complainant its fair share of the oil in similar fields throughout Texas, and said factors being known to it in the East Texas field, such an order could
 38 and should be adopted there, but for reasons and purposes inconsistent with their duty to the State of Texas and this complainant, they have deliberately failed and refused to embrace such factors in such an order and thereby are unnecessarily and inexcusably confiscating complainant's property.

(6) That since the filing of this complaint, Jerry Sadler has succeeded said C. V. Terrell as a member of said Commission, and Lon A. Smith has succeeded as Chairman of said Commission, and Gerald C. Mann has succeeded said McCraw as Attorney General, and said orders hereinbefore complained of have been re-adopted and said allegations herein made are directed to said new parties.

Wherefore, complainant prays as in its original bill of complaint.

DAN MOODY,
 RICE M. TILLEY,
 PHILLIP TOCKER.

Amendment to Original Bill of Complaint. Filed January 17, 1939.

AMENDED ANSWER OF RESPONDENTS.

(Title Omitted.)

To the Honorable Court aforesaid:

I.

Defenses to Claims for Relief Set Forth in
Paragraph III.

(1) Respondents admit that complainant is the owner of an oil, gas and mineral leasehold estate in a certain 24.99 acre tract situated and located in the W. H. Castleberry League in Gregg County, Texas, B. C. Todd, et al, fee owners.

(2) Respondents admit that complainant has five wells drilled in accordance with existing rules, regulations, and orders of the Railroad Commission and produces oil from said land.

(3) Respondents admit that complainant was, at the time of the filing of the complaint, producing from said lease in accordance with the order of the Railroad Commission of Texas dated August 29, 1938, the following number of barrels of oil per day: Well No. 1, 22.388; Well No. 2, 22.272; Well No. 3, 22.388; Well No. 4, 22.504; and Well No. 5, 22.272.

II.

Defenses to Claims for Relief Set Forth in
Paragraph IV.

(1) Respondents admit that complainant's lease and the wells thereon are located in what is known as the East Texas Oil Field.

(2) Respondents admit that said field is water driven and embraces a territory of about forty miles in length and an average of four miles in width. The respondents allege, however, that the field is more than four miles in width in the East-West direction in that portion of the field where complainant's wells are located.

(3) Respondents admit that the West side of the field is underlain with what is known as bottom water, and that no water underlies the East one-half and that water is slowly but perceptibly rising in the Western portion thereof.

(4) Respondents deny that one well to 10 acres can reasonably drain such area in the East Texas field during the flowing life thereof.

(5) Respondents admit that the field is at the present time substantially a flowing field, but deny that it will remain a flowing field throughout its life, and allege that the field is now a flowing field only because of the restrictions in rate of production which have been placed on it by the Railroad Commission of Texas.

(6) Respondents admit that there are approximately 133,000 acres underlain by oil in said field, but respondents say that they are without knowledge or information sufficient to form a belief as to the truth of the averment that the average sand thickness of the oil bearing sand is 42 feet, or that the said thickness under the complainant's lease is 100 feet.

41 (7) Respondents say that they are without knowledge or information sufficient to form a belief as to the truth of the averment that there are 5,586,000 acre feet of oil sand in the entire field or that there are 2,499 acre feet of oil sand under complainant's

lease, and in this connection respondents aver that the number of acre feet of oil sand in the entire field and under complainant's lease cannot be ascertained with sufficient accuracy to be a proper basis for the proration of the allowable production of oil in the East Texas field.

(8) Respondents admit that as of August 31, 1938, the total production of oil from said field was approximately 1,238,080,665 barrels and that the production of oil from complainant's lease as of August 31, 1938, was 345,165.59 barrels.

(9) Respondents admit that the average controlled potential in the East Texas Field is 605 barrels and the average controlled potential of each well on complainant's lease is 964 barrels.

(10) Respondents admit that as of August 30, 1938, there were approximately 25,500 wells producing and authorized to be drilled in said field.

(11) Respondents admit that sixty per cent of these wells were allowed as exceptions to Rule 37 of the rules and regulations of the Railroad Commission, and allege that all of the five wells on the complainant's lease were also drilled as exceptions to Rule 37 of the rules and regulations of the Railroad Commission.

(12) Respondents deny that the uncontrolled potential of the wells in said field varies from less than 20 barrels per well to 30,000 barrels per well per day.

(13) Respondents admit that the complainant's wells are situated in what is known as the "Gladewater Nose", and admit that these wells are very favorably situated on the structure and producing horizon of the East Texas field.

42 (14) Respondents deny that complainant's wells are equidistant between the East and West lines of the field, but allege that the complainant's wells are located approximately 4.9 miles from the Western edge of said field and only 3.3 miles from the Eastern edge of said field.

(15) Respondents say that they are without knowledge or information sufficient to form a belief as to the truth of the averments that the oil saturated sands under the complainant's wells are of maximum thickness, but admit that there is no danger of encroachment of water on said wells at the present time, and for a long time to come.

(16) Respondents admit that said wells can be continually produced for many months without excessive gas-oil ratio and without physical waste under the present system of regulation imposed by the Railroad Commission, but deny that these wells will produce without waste if they are not limited in accordance with the present system of regulation.

(17) Respondents say that they are without knowledge or information sufficient to form a belief as to the truth of the averments that the oil producing sands to the East of the complainant's properties are continually decreasing in thickness, but admit that these sands pinch to nothing on the Eastern edge.

(18) Respondents deny that all of the wells lying between complainant's property and the Eastern edge are incapable of producing nearly as much oil as complainant's wells, but admit that none of the wells lying between complainant's property and the Western edge of the field are capable of producing for as long a time as complainant's wells, and further allege that complainant's

43 well will produce longer than practically all of the wells lying between complainant's property and the Western edge of the field only because of the restrictions which the Railroad Commission is now requiring.

(19) Respondents say that they are without knowledge or information sufficient to form a belief as to the truth of the averments that the total recoverable oil under complainant's lease is approximately 57,000 barrels per acre and that the total recoverable oil in the common pool existing in the East Texas field is approximately 2,500,000,000 barrels.

III.

Defenses to Claims for Relief Set Forth in Paragraph V.

(1) Respondents deny that information as to the sand thickness, properties of the reservoir sands and their fluid content can be determined in a field such as the East Texas Field with sufficient accuracy to make it possible to estimate the quantity of oil and gas in the various portions of such field with sufficient precision to make an equitable allocation of production on the basis of such estimate. In this connection, respondents aver that in a field such as the East Texas field a system of allocation which gives each owner of a lease in this field an allowable which bears the same relation to the total allowable of the field that the reserves under his tract bear to the total reserves in the field, would not insure to the owners of each tract of land in such a field the amount of oil that he has underlying his tract. The reason for this is that the East Texas field is a water driven field. Water lies all along the Western edge of the field and as oil is produced from the field, the water

encroaches from the Western edge and pushes oil toward the East. Owners of wells on the Western edge of the field, therefore, will not, under any system of allocation, obtain the amount of oil which they have in place under their leases.

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IV.

Defenses to Claims for Relief Set Forth in
Paragraph VII.

(1) Respondents deny that complainant would drain only its fair share of the oil through the wells located on its lease at the present time if its daily allowable bore the same relation to the total daily allowable as the recoverable oil thereunder bears to the total recoverable oil in the field, but allege that under such a system complainant would drain more than its fair share of the total recoverable oil in the field.

(2) Respondents admit that the allowable in said field are adjusted on the basis of controlled potential of said wells as determined by the Railroad Commission, but deny that these potentials are fiction, and deny that the complainant is placed in the position of surrendering its property through drainage or being compelled to drill additional or unnecessary wells.

(3) Respondents admit that they do not take into consideration the cost of drilling offsets to prevent drainage of his property under the system of allocation of the allowable.

(4) Respondents says that they are without knowledge or information sufficient to form a belief as to the truth of the averments that complainant's allowable does not bear the same relationship to the total allowable

as the recoverable oil under its lease bears to the total recoverable oil in the East Texas field.

(5) Respondents say that they are without knowledge or information sufficient to form a belief as to the truth of the averment that the Commission's allowable if based on such formula will approximate 235 barrels per days, but admit that the Commission's allowable upon complainant's wells now approximates 112 barrels per day.

45

V.

Defenses to Claims for Relief Set Forth in Paragraph VIII.

(1) Respondents admit that the present plan of pro-rata does not take into consideration acreage of leases, or density of drilling on leases, and admit that an operator having a well on one acre of land may recover ultimately ten times as many barrels of oil per acre as an operator on an adjoining lease which has a density of only one well to ten acres. This, however, could not in any manner cause irreparable damage to complainant for the reason that the density of drilling around complainant's lease is on an average no greater than the density of drilling on complainant's lease, and the oil under complainant's tract is constantly being replenished by oil drained from tracts to the west of complainant's tract.

(2) Respondents admit that operators of a more closely drilled tract are given advantage over operators of less closely drilled tracts in the production of oil, but allege that this advantage should be given because the drilling of a larger number of wells under regulation of the Railroad Commission of Texas on a tract will increase the total recoverable oil in the field.

(3) Respondents admit that they granted a permit to R. M. Wood on a strip immediately to the south of complainant's lease, comprising approximately one acre and that he has been and is being permitted to produce from said well since its completion on August 22, 1937, 22,272 barrels per day, and that the allowable on each of the five wells on complainant's lease is approximately the same.

(4) Respondents deny, however, that said R. M. Wood will by an order of the Commission take complainant's oil, but allege that complainant has not and will not suffer from drainage under the present system of allocation.

46. (5) Respondents admit that there are contained in the East Texas field many hundreds of tracts of land of less than five acres, and of less than ten acres, on which the Commission has authorized the drilling of wells, but deny that this drilling has been on the average of one well to one acre.

(6) Respondents further allege that the density of drilling in the area around complainant's lease, and in the field as a whole, is no greater than the density of drilling on complainant's lease.

(7) Respondents deny that by reason of the present system of proration the wells lying to the East of complainant's lease have as much oil as same had originally thereunder, but allege that the wells to the east of complainant's lease have a smaller portion on the average of the oil which was originally in place than the complainant's lease. This is caused by the fact that the pressure in the oil sand under complainant's lease is on an average higher than the pressures under the leases

to the East of complainant's lease and, therefore, the reserves have decreased to a lesser extent.

(8) Respondents deny that the rate of withdrawal from every well to the East of complainant's lease is equal to the allowable on complainant's well.

(9) Respondents deny that the rate of withdrawal from every well to the east of complainant's lease is equal to the allowable on complainant's wells.

(10) Respondents deny that complainant has been drained of recoverable oil under the respondent's system of proration, and deny that the reserves of the leases more densely drilled than the complainant's lease have arisen and will continue to rise and deny that the complainant's reserves have decreased and will continue to decrease.

47 (11) Respondents deny that, if the present proration plan is maintained, complainant will lose oil which it is entitled to long prior to the exhaustion of the oil and gas in the reservoir, but allege that the reservoir will be largely exhausted by the time complainant's wells are drowned out because of the fact that complainant's wells are now located almost five miles from the Western edge of the field.

(12) Respondents deny that its proration order is discriminatory, confiscatory, oppressive and grossly inequitable.

VI.

Defenses to Claims for Relief Set Forth in Paragraph IX.

(1) Respondents admit that complainant is entitled to recover oil ratably with other owners in the East.

Texas field, and in this connection, respondents aver that the present method of proration of the allowable production of oil gives consideration to all proper determinative factors which can be considered without danger of physical waste.

VII.

Defenses to Claims for Relief Set Forth in Paragraph X.

(1) Respondents deny that the straight potential basis of allocation is inequitable, arbitrary, and unreasonable, or that it will be equitable only if well spacing is uniform or if potentials of wells are proportional to the recoverable oil in the drainage area of each well. In this connection respondents allege that the present formula is most reasonable to attain the objective of allowing and permitting each well owner in the field to obtain his fair share of oil and gas underlying his property and to attain a like objective of preventing waste and conserving the State's natural resources.

(2) Respondents deny that potentials which are determined by potential contour lines governing the potential ability of wells to produce are fictitious, but allege that the potentials of wells in the East Texas field can be determined with a reasonable degree of accuracy by potential tests on key wells and contouring the results of potential tests of these key wells.

(3) Respondents deny that the disparity between the allowable production between complainant's well and the poorest wells in the field is less than four barrels, but allege that the allowables of the complainant's well are more than ten times as great as the allowable of the poorest wells in the field.

(4) Respondents admit that complainant is permitted to produce 2.32 per cent of the hourly potential of each of its wells and that all other wells are also allowed to produce 2.32 per cent of this potential except for marginal wells, which have a potential of less than 20 barrels per day and which cannot be restricted by law to an allowable less than their potential.

(5) Respondents deny that said proration order under attack bears no relationship to the prevention of physical waste, but allege that the operation of such proration order prevents physical waste.

(6) Respondents deny that complainant must have a daily allowable of 235 barrels allocated to complainant's lease in order to allow it to have an equal opportunity with other owners in the East Texas field to recover that portion of the oil to which it is entitled, but on the contrary alleged that complainant will recover, under the existing order, that portion of the oil in the East Texas field to which it is entitled.

VIII.

Defenses to Claims for Relief Set Forth in Paragraph X-A.

(1) Respondents deny all of the averments of fact contained in subdivision (1) of Paragraph X-A of the Complaint.

49 (2) Respondents deny all of the averments of fact contained in sub-paragraph (2) of Paragraph X-A. of the Complaint.

(3) Respondents admit that all wells are allowed to produce 2.32% of their potential except marginal wells.

which have a potential of not more than 20 barrels per day, and that said marginal wells are generally located on the poorest and worst part of the structure in said field, are less prolific and generally go on the pump first; respondents deny that the marginal wells on the west side of the field have the poorest bottom hole pressure, and say that said wells generally have higher bottom hole pressure. Respondents admit that marginal wells on the east side of the field generally have low bottom hole pressure. Respondents admit that said marginal wells generally have less oil producing sand thickness and are otherwise unfavorably situated. Respondents deny all other allegations contained in subdivision 3 of Paragraph X-A of the complaint.

(4) Respondents say that they do not have knowledge or information sufficient to form a belief as to the truth of the averment that there are thousands and thousands of wells throughout the field more densely spaced than complainant's and that most of said wells are the second to tenth wells on tracts of less than 10 acres owned by one operator on one tract. Respondents deny all other allegations contained in said subparagraph 4 of Paragraph X-A of the Complaint.

(5) Respondents admit that complainant has made application to the Railroad Commission of Texas for an adjustment in allowable, but respondents deny that all of the allegations made in the complaint were made before said Commission and respondents further deny that competent evidence was offered in support thereof sufficient for the Railroad Commission to make an adjustment in allowable for complainant. In connection herewith, respondents aver that complainant did not furnish any competent or sufficient evidence in any of the hearings before the Railroad Commission of Texas to justify said Commission

in adjusting said allowable and that the evidence offered by complainant at said hearings consisted solely of non-expert testimony which was wholly insufficient to warrant any change in the method of proration or in the allowable. Respondents admit that in other oil fields in the State of Texas as well as in the East Texas field, the Railroad Commission of Texas has adopted factors necessary to give producers their share of the oil. Respondents deny all other allegations contained in sub-paragraph (5) of X-A.

(6) Respondents admit the allegations contained in sub-paragraph 6 of paragraph X-A.

IX.

Defenses to Claims for Relief Set Forth in Paragraph XI.

(1) Respondents deny that complainant can produce what it contends is its fair portion of the daily oil allowable without causing waste, but on the contrary allege that, if complainant is allowed to produce what it claims is its fair oil allowable and all other operators in similar situations in the East Texas field are allowed to produce with a like allowable, waste will occur which will not occur if all operators adhere to the present system of proration in the East Texas field.

(2) Respondents allege that, if complainant and all others similarly situated are allowed to produce at the rate which complainant contends for, there will be a rapid drop in the bottom hole pressure of the East Texas field, gas will come out of solution and enormous quantities of oil will be left in the reservoir never to be produced, all of which will result in physical waste.

Defenses to Claims for Relief Set Forth in
Paragraph XII.

(1) Respondents admit that on or about February 24, 1938, complainant filed an application asking an increase in allowable and in the alternative asked that, if it was shown not to be entitled by law to such relief, it be given permits to drill twenty more wells.

(2) Respondents deny, however, that this was necessary in order to give complainant an equal opportunity to recover its fair share of oil, but on the contrary allege that under the present system of allocation complainant will recover its fair share of the oil in the East Texas field.

(3) Respondents admit that a hearing on said application was held March 11, 1939, and that on March 17, 1938, the Commission entered its order denying an increase in allowables and granting the complainant a permit for only one well as a direct offset to the well therefore granted by the Commission to said R. M. Wood.

(4) Respondents deny that its plan of allocation is unfair, inequitable or contrary to complainant's constitutional rights.

(5) Respondents deny that the Railroad Commission of Texas has wholly failed and refused to give any consideration to complainant's rights in the premises, and in this connection, respondents aver that the Railroad Commission of Texas has given a full and fair hearing and proper consideration to complainant's rights.

XI.

Defenses to Claims for Relief Set Forth in
Paragraph XIII.

(1) Respondents deny that by maintaining its present order the Railroad Commission has knowingly maintained illegal orders and deny that drainage from complainant's properties has resulted and that complainant has been damaged thereby.

52 (2) Respondents deny that complainant's properties have been drained under the Commission's orders, but allege that complainant has benefited by the operation of the Commission's order in that complainant has drained oil from other property owners in the East Texas field.

(3) Respondents further deny that complainant will lose oil by drainage or migration in the future, and further allege that oil will drain to complainant's property for a long time to come.

XII.

Defenses to Claims for Relief Set Forth in
Paragraph XIV.

(1) Respondents say that they are without knowledge or information sufficient to form a belief as to the truth of the averment that complainant fears that it will be sued by its royalty owners for damages and for forfeiture of it lease.

XIII.

Defenses to Claims for Relief Set Forth in
Paragraph XV.

(1). Respondents deny the averments contained in Paragraph ~~XV~~ of the Complaint.

XIV.

Defenses to Claims for Relief Set Forth in
Paragraph XVI.

(1) Respondents deny all of the averments contained in Paragraph XVI of the Complaint.

Wherefore, it is prayed all relief prayed for by Complainant be in all things denied and that respondents go hence and recover their costs.

GERALD C. MANN,
Attorney General of Texas,

53

JAMES P. HART,
Assistant Attorney General of
Texas,

DURWARD D. MAHON,
Assistant Attorney General of
Texas,

State Capitol, Austin, Texas.

HARRY S. POLLARD,
Attorneys for Respondents.

Consent is given to the filing of the foregoing amended answer this 20th day of January, 1939.

DAN MOODY,
Attorney for Complainant.

Amended Answer of Respondents. Filed 20th day of January, 1939.

MEMORANDUM OPINION.

(Title Omitted.)

McMILLAN, Judge:

This case as originally filed was one for three Judges. Complainant, however, abandoned its application for interlocutory relief and the case was, by the agreement of all parties, submitted to one Judge for final determination on its merits.

Complainant sues for an injunction to restrain the enforcement by the Commission of the order of August 29th, 1938, in so far as it affects the production of oil from its mineral lease in the East Texas field. By stipulation of the parties, it was agreed that it would be unnecessary to amend to cover the orders subsequently entered continuing the same plan of proration.

More than the jurisdictional amount is shown to be involved and the order and its method of enforcement and application are attacked as confiscatory. The jurisdiction of the Court appears of record and is in no way challenged by any of the parties.

Article 6029 of the Revised Civil Statutes of Texas directs the Commission generally to make and enforce orders for the conservation of crude petroleum oil to prevent the waste thereof.

Article 6049c, in so far as it is pertinent here, provides:

55 "In the event any such rule, regulation or order which the Commission may adopt provides for the limitation or fixing of the production of crude petroleum oil, or of natural gas from wells producing gas only, in any pool or portion thereof, the Commission shall distribute, prorate, or otherwise apportion or allocate, the allowable production among the various producers on a reasonable basis."

The order of August 29th, 1938, in so far as it applied to the East Texas field, after fixing a top allowable of not to exceed 450,000 barrels a day as desirable, proceeded as follows:

"Rule 23 (a). Therefore, it is further Ordered by the Railroad Commission of Texas that during each twenty-four (24) hour period beginning at 7 o'clock a. m., Central Standard Time, September 1, 1938, the owner or operator or manager of each well in the East Texas Field shall be permitted either collectively or individually, to produce from each well a maximum of Two and Thirty-two Hundredths (2.32%) Per Cent of its hourly potential capacity as determined by the Commission."

By subsequent orders, shutdowns for two days a week have been put in effect. Furthermore, the evidence shows without contradiction, and in fact the parties have stipulated, that the method of application and enforcement of this order by the Commission is very different from the actual wording of the order itself. According to the stipulation which the parties have filed in the case, the Commission's interpretation, application and enforcement of this order is substantially as follows: A top allowable for the days during which the wells were allowed to produce of 522,500 barrels was fixed. Each well in the field that could not produce as much as 20 barrels per day was allowed to make all it could produce.

56 Where the figure of 2.32% of the hourly potential of any well amounted to less than 20 barrels a day, that figure was disregarded and the well was allowed to produce 20 barrels a day. Where the figure of 2.32% would amount to more than 20 barrels per day, the well was allowed to produce on that basis. This application of the order resulted in the following: Approximately 451 wells, not any one of which was capable of producing as much as 20 barrels per day, were allowed

to produce daily a total of approximately 5,250 barrels. Approximately 19,032 wells whose individual hourly potential when multiplied by 2.32% amounted to less than 20 barrels, were each allowed to produce a full 20 barrels per day; or from all of such wells a total of approximately 380,640 barrels per day. These were wells whose hourly potential ranged anywhere from 1 barrel to 860 barrels per hour. Approximately 6,325 wells whose individual potential when multiplied by 2.32% amounted to more than 20 barrels were each allowed to produce daily that number of barrels which equaled the product of its hourly potential multiplied by 2.32%. The total daily production from these wells was approximately 136,610 barrels. These wells had an hourly potential ranging from 865 barrels per hour to about 1,100 barrels per hour. In practical operation, the daily allowable of no well was controlled by the factor 2.32% of its hourly potential unless such well had a potential of 865 barrels or more per hour.

It is manifest that the way in which the Commission interprets, applies and enforces this order is entirely different from the order. Accordingly, the question of the validity of the actual order itself is not controlling, for as said by the Supreme Court in the Greene case, 244 U. S. 507:

"A valid law may be wrongfully administered by officers of the State, and so as to make such administration an illegal burden and exaction upon the individual."

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See also Southern Realty Corporation v. McCallum, 1 F. Supp. at page 619.

Therefore the matter to be considered here is not the validity of the order as written but as construed and enforced by the Commission.

Complainant, in its brief, makes it clear that it does not attempt to attack the validity of the conservation statutes; that it does not now directly attack the top allowable fixed for the field; and further that it does not attack the spacing rule, generally called Rule 37. The gravamen of its complaint lies in its assertion, forcibly presented, that the Commission does not allocate the allowed production among the various producers "on a reasonable basis". In other words, it says that granting the right of the State to conserve its natural resources, conceding for the present the validity of the Commission's order in fixing the top allowable of the field, the manner in which this allowable has been allocated to the various parties is discriminatory and constitutes a confiscation of complainant's property.

Respondents, on their part, set up generally the characteristics of the East Texas field, the necessity for regulation, proration and so forth. They then assert that owing to the number of wells in the field and the conditions there existing, the present order is practically the only one that can be feasibly worked out. Large amounts of evidence were introduced with regard to the East Texas field generally, covering its characteristics, formations, geology and production problems. Those are matters which have all been gone over and discussed in numerous other cases involving that field and it is not necessary to again set them out here. A brief statement of some of the pertinent facts developed upon the trial, coupled with the

statements which have been heretofore made, will
58 be sufficient to dispose of this case.

Complainant has a lease of something over twenty-four acres and on this lease it has five wells. All of the wells are producers and, according to the Commission's potentials, they are capable of producing in excess of 865 barrels per hour. Under the order as applied, these wells are allowed to produce a fraction over 22 barrels a day for five days a week. The field is approximately four miles long and has an average width of about four miles. There are

about 26,000 oil wells in the field. Of these, all save approximately 25 are producers. There are some wells which are capable of producing only 6 or 7 barrels a day and some wells that will produce over 25,000 barrels a day. Between those figures there is a wide spread in potentials. Complainant's wells, according to the Commission's figures, will produce on open flow over 20,000 barrels a day. But the actual result of production on open flow, of course, is not known and any such production would in all probability immediately result in a lessening of potentials. However, the figures as computed indicate the relative capacity of the various wells, according to the Commission's notion. Complainant attacks the method of obtaining these potentials but it is unnecessary to pass on that matter to decide this case. It can and should be determined on broader issues. The wells are located upon tracts of various sizes. Constant exceptions to the spacing rules have resulted in great density in drilling. In many instances, there are wells on a fraction of an acre. In complainant's case, there is an average of one well to about five acres. The structure and formation of the field varies. Toward the West, water is encroaching. Toward the East, the producing sand pinches out. There is apparently a well defined drainage in an Easterly direction. Complainant's lease is conceded to be one of the most favorably situated in the field. It is on what is known as the "Fairway". It has one of the thickest of the producing sand formations. It is well located on the structure and is highly desirable from the standpoint of permeability and porosity. It has so far encountered no water trouble. Complainant can produce without difficulty the oil lying under its land with the five wells which it has at this time. It has from time to time complained to the Commission with regard to its allowable without result. On one occasion, conceiving that the present scheme constituted nothing more than a per well basis of allocation, it applied for permit to drill a large number

of additional wells. This application was generally denied, but a permit was given for one additional well, which has not been drilled.

The allowance of 20 barrels per day to all wells capable of making it, plus the amount allowed to those pumping wells incapable of making 20 barrels a day, takes up all of the top allowable of 522,500 barrels with the exception of something slightly over seven thousand barrels a day. Accordingly, the only allowable which remains to be prorated among the higher potential wells upon a potential basis is this negligible amount. Cottingham, p. 67; Hudnall, p. 155.

The respondents' engineers frankly admitted that the present scheme of proration is nothing more or less than one on a per well basis. See testimony of Cottingham, page 67, and Hudnall, page 156. Without regard to their admissions, the uncontradicted evidence manifestly shows that such is the fact. Any well that can make 20 barrels per day is allowed to make it. That portion of the top allowable not taken by the wells which lag below 20 barrels a day is assigned to the more powerful or valuable wells.

60 Complainant's wells, which are admitted to be among the "highest producers in the field, are given under this arrangement the pittance of about 2 barrels a day over other wells which admittedly could not make a fractional part of the production that complainant's wells can make.

The proration of this field on a per well basis has been considered and condemned in a number of cases before this. See *Peoples Petroleum Producers, Inc. v. Smith, et al*, 1 F. Supp. 361; *Peoples Petroleum Producers, Inc. v. Lon A. Smith, et al*, Equity No. 386; Tyler Division, Eastern District of Texas, decided March 17, 1933, unreported; *Rowan & Nichols Oil Company v. Terrell, et al*, Equity No. 479, Tyler Division, Eastern District of Texas, decided March 17, 1933, and unreported. It is unnecessary to restate the reasons given in those cases for con-

demning this method of proration. It is sufficient to say that it takes no account of the difference in the wells, of the richness or thickness of the sand, of the location upon the structure, of the porosity or permeability of the sand, of the estimated oil reserves, or of the acreage upon which the respective wells are situated. The worst property is raised to the level of the best and the best is lowered to the level of the worst.

The disregard of acreage alone should be sufficient to condemn the plan. Here we have a case where a producer with a well to five acres can produce no more than his neighbor who adjoins him with a well on a fraction of an acre. Under the law in Texas, this oil in place belongs to the owner of the land or the leasehold. Any plan which contemplates that any party who can get enough ground to stick a drill bit down and obtain a well is entitled to produce as much as a party who owns ten times as much acreage adjoining him is manifestly wrong. The evidence shows that in a formation like the complainant's lease, one

61 well can sufficiently drain ten acres. Therefore, there is no good reason why there should be fifteen or twenty wells drilled upon such a leasehold.

Yet that is the result if complainant is to compete with a neighbor who drills a well upon a fraction of an acre.

It is manifest that other things being equal, the party with the largest acreage has the most oil. There is nothing in this order however that protects him in that ownership. If a trust fund in which various parties owned different amounts of money was to be distributed, the natural assumption would be that the distribution would be on a prorata basis. If one man had \$100 and another \$1,000, the man with the \$1,000 would get \$10 for every \$1 the other man got. However, suppose for some reason it was determined that either the welfare of the fund or the community dictated that each person should draw \$20 per day from the fund. When the man who had \$100 in the fund had drawn for five days, he would stop. The man

who had \$1,000 would continue to draw his \$20 a day for another forty-five days.

However, under this order, a man who has less oil under his lease than his neighbor does not stop when he gets his part of the oil. He continues to go on at 20 barrels per day as long as he can get any oil either from his own land or drain it from his neighbor's. In the meantime, his better situated neighbor sits by unable to protect himself because of this unequal order.

To these matters the Commission responds that the situation in the East Texas field is difficult and no better order can be prepared. It is, of course, not the duty of the Court to write a better order, nor does the obligation rest upon complainant to suggest one. The fact that regulation is difficult does not justify confiscation. The State inter-

62 ferres with the lawful owner of this oil upon the theory that it is conserving a natural resource. Its right to do this has been upheld in many cases unnecessary to cite. The idea was hinged originally, and must continue to stand largely, upon the theory of the prevention of waste. The public generally has no title in this oil. If its interest in it is so great that it must needs regulate it to the extent of confiscation, then it approaches the point of expropriation and it must pay for what it does. Obviously this regulation is not proceeding upon any such theory.

Respondents say that if small wells are not allowed to produce sufficiently to make them profitable they will be abandoned and there will be an economic loss. The number of these small wells is, in the opinion of the Court, negligible. Furthermore, the evidence is not at all conclusive that any substantial reserves lying around these wells will be ultimately lost. Moreover, the evidence indicates that the production of these wells with the large amount of water that is brought up with the oil is even more harmful and wasteful to the field than the abandonment of those wells themselves would be. They represent

a small factor in the ultimate recovery of this vast field and should not be allowed to dominate its method of production. Be that as it may, it does not follow that the loss of these small wells would justify the taking without compensation of complainant's property. This order places complainant in position where without ability to fence or fend for itself, it must stand idly by and see its oil drained by wells lying to the East. According to the figures, if nothing happens to complainant's wells and water does not come in from the West, it will take twenty-eight years for it to produce its reserve under the present system of proration. On the basis of these same figures, the field generally will be depleted in about eleven years. It is manifest that the time element is important here. The

Commission's engineer Cottingham frankly admitted that the present order operates unequally
 63² as to complainant, but asserted his opinion that a long period of years would equalize the matter. The question as to whether it will or not is highly problematical. The matter of present-day confiscation is certain. Respondents are not entitled to require complainant to gamble as to what will happen to its oil or its markets over a period of twenty-five or thirty years.

Furthermore, the Court is not of the opinion that the evidence bears the respondents out in the contention that the present order is the only one possible. As said before, it is not the Court's function to draw an order. However, the evidence is not at all clear that this 522,500 barrel top allowable is fixed solely for the prevention of waste. Respondents' engineer Hudnall frankly admitted that he was of the opinion that a higher allowable could be fixed without injury. Their chief engineer, Cottingham, did not deny that such was the case. It is manifest from all of the evidence that the allowable has been fixed, with an eye to the market as well as with an eye to the prevention of waste. Complainant does not attack the idea of a top allowable. That, however, does not preclude the Court

from considering the matter in contemplating the reasonableness of this entire plan of proration. Furthermore, it is evident from the record that it is not necessary to allow all of these wells 20 barrels per producing day in order for them to operate. An allowance of 20 barrels is an arbitrary figure. There was no evidence to show they could not survive on less. In fact the evidence indicates the contrary. There is no reason why many of these wells should not be cut back to a position more nearly approaching their productive capacity and reserve.

64 The difficulty in which the Commission finds

itself grows largely out of its relaxation of its own spacing rules. The drilling of thousands of wells, unnecessary so far as the public interest is concerned, has required them to listen to the demands of those well owners at the expense of other operators better situated. No effort has apparently been made to require those parties producing upon too densely drilled acreage to pool their tracts. There is no justification in law for taking complainant's property in order to recoup these parties who drilled these unnecessary wells.

The duty enjoined on the Commission by the Statute is to prevent waste. When in order to do that it has to limit production, then the Statute says it shall allocate the allowable on a reasonable basis. Further than that it is without power to go. It is not its function to repay owners for wells drilled or to guarantee them a return. It can not enrich one man at the expense of another. It is obvious that this order as enforced does not apportion the allowable so far as complainant is concerned on a reasonable basis. If it does, then complainant might as well have had five of the poorest wells as five of the best. It might just as well have bought a one acre lease as twenty-five acres. It might just as well have bought on the edge of the field as the center so long as its wells could make 20 barrels a day. The small surplus allotted on potential amounts to practically nothing and is so admitted by respondents' own engineers.

Respondents, in an effort to extenuate the inequality of their order, suggest the difficulty presented by the marginal well law. Article 6049b, Revised Civil Statutes of 1925. This Act relates to pumping wells and so far as East Texas is concerned forbids the artificial curtailment of production below 20 barrels a day if such reduction would

65 cause damage to the well, or loss of ultimate recovery, or premature abandonment. Their position with regard to this matter is equivocal. There are about four hundred fifty of these pumpers in the field. If, as suggested, the law applies to them, then the order of August 29th, 1938, made no effort to comply with the law for the 2.32% of hourly potentials would never give these wells 20 barrels a day. Their interpretation and enforcement of the order does not do it for the two day a week shutdown cuts a 20 barrel a day allowable to about 14 barrels. All of these pumpers put together do not produce on an average over 5,500 barrels a day. Any one of complainant's wells at half its potential open flow would produce more than that.

Accordingly, it is apparent that the effect of the so-called statutory marginal wells is very slight so far as the general scheme of proration for that field is concerned. The Statute offers no excuse for a flat 20 barrel allowance to other wells running up to 860 barrels per hour.

If it be conceded that the Statute is valid (which has been seriously questioned) and that these strictly marginal wells must be allowed 20 barrels a day if they can make it, still that furnishes no excuse for confiscating the property of some other producer better situated. Pumping wells of this variety might appear in a field to such an extent as to exhaust the entire allowable, thereby leaving nothing for high potential flowing wells. No such absurd result was ever intended. This Statute was obviously designed to keep these small pumpers from being slighted off, it being contemplated that the better wells would have a much higher allowable. If, however, this marginal

minimum must be considered as a component element of a proration scheme, thereby unreasonably reducing the allowables of other better wells, either the Statute or the scheme must fall.

There is no merit in the contention that complainant is estopped to attack this order because of laches. In the first place this order applied and enforced as the
66 Commission now interprets it is not the same order which existed over the period of years during which the field has been regulated. The continual increase in drilling has operated to make this system of proration progressively more oppressive until the present administration of the order has in effect put the field upon a per well basis. The potential factors of the order have practically become nil. Furthermore the record shows that the complainant has constantly protested to the Commission with regard to enforcement of the order, without result. It has attempted to relieve itself by applying for permits to drill additional wells, how ever unnecessary they might be in the production of its property. Further than that, the matter involved here now is one of confiscation. The orders have been submitted to under the threat of penalties. The right to assert complainant's constitutional rights has not been lost.

The Court is not attempting here to pass upon the order generally or upon the rights of anyone with reference to it save those of complainant. In so far as complainant is concerned, the Court is of the opinion upon the evidence and the law that the order as applied and enforced is confiscatory and void. The complainant has not, however, prayed the Court for a sweeping writ allowing it to produce its wells without restriction. It only asks for what it considers its fair share of the allowable as now fixed for the field. It is the opinion of the Court that it is entitled to such an injunction restraining the respondents from interfering with it in so producing its property. The matter of the character of the decree, including the question as

to the amount to be produced pending appeal or the promulgation of a new order by the Commission, may be settled on notice.

June 12th, 1939.

The Clerk is directed to file this Memorandum Opinion with the papers in the case.

ROBERT J. McMILLAN,
Judge.

67 Memorandum Opinion. Filed 12th day of June, 1939.

68

JUDGMENT.

(Title Omitted.)

The above entitled and numbered suit came on for trial at Austin in the Austin Division of the Western District of Texas on February 6, 1939, when came the Complainant Rowan & Nichols Oil Company, by its counsel, and announced ready for trial and also came the Respondents Railroad Commission of Texas, Lon A. Smith, Ernest O. Thompson, Jerry Sadler, and Gerald C. Mann, by their counsel, and announced ready for trial.

Thereupon the Court heard the pleadings and the suit proceeded to trial and was on trial from day to day until February 10, 1939, when, introduction of testimony having been concluded, all parties moved for judgment and the Court heard argument of counsel; upon the completion of counsels' argument, the Court took the suit under advisement and on June 12, 1939, filed his opinion in this suit and announced it to be the opinion of the Court that the

law and the facts were with Complainant; that the proration order of the Railroad Commission of Texas of date August 29, 1938, applicable to the East Texas oil field, as pleaded in Complainant's Bill of Complaint, and the several extensions and renewals of said order, including the order of December 14, 1938, in force at the time of trial, are void as the same have been and are interpreted, applied and enforced by the Railroad Commission of Texas to control production of oil by Complainant from the five wells on Complainant's Todd "B" lease of approximately 25 acres, in the W. H. Castleberry Survey, Gregg County, Texas; and that, Complainant not having sought to produce without restrain oil from its lease or attacked the daily field allowable of 522,000 barrels of oil, but only having sought injunctive relief restraining Respondents from interfering with Complainant in the production of its fair share of such daily field allowable, Complainant is entitled to an injunction restraining Respondents from interfering with Complainant in the daily production of its fair share of the daily field allowable fixed by the Commission for the East Texas field and the other relief herein granted.

It is accordingly ordered, adjudged and decreed by the Court that the order of the Railroad Commission of Texas of August 29, 1938, and the several extensions and renewals thereof, including the order of December 14, 1938, fixing and allocating among wells in the East Texas field the daily allowable for the East Texas field, are void as the same have been and are being interpreted, applied and enforced by Respondents to control production of oil by Complainant from the five wells on Complainant's said lease; that the Respondents, their agents, servants, employees and representatives, be, and they are, each and all, hereby enjoined and restrained from so enforcing or attempting so to enforce said orders, or any of them, against Complainant in the production of oil from said lease, and

from enforcing or attempting to enforce against Complainant in the production of oil from said lease, any such plan of proration or allocation of field allowable among wells as said orders have been interpreted by the Railroad Commission to require; and Respondents, their agents, servants, employees and representatives are restrained from interfering with Complainant in daily producing from the wells

70 on its said lease (except on such days as the entire East Texas oil field may be, by valid order of the Railroad Commission, prohibited from producing) that amount of oil which bears to the daily field allowable fixed by the Railroad Commission the ratio which 220 barrels bears to 522,000 barrels; and Respondents, their agents, servants, employees and representatives, be, and they are, each and all, enjoined and restrained from refusing to issue tenders to Complainant for oil produced from said lease in conformity with this judgment and from otherwise interfering with the transportation and marketing of oil so produced from said lease.

All costs of this suit are taxed against Respondents.

The Clerk is directed to enter this judgment.

To which action, order, and judgment of the Court the respondents in open Court duly excepted.

Entered at Austin, Texas, this the 14th day of June, 1939.

ROBERT J. McMILLAN,
Judge.

Entered: Eq. Min. Vol. G, page 461.

Judgment Filed 14th day of June, 1939.

MOTION. TO STAY JUDGMENT.

(Title Omitted.)

To said Honorable Court:

Come now the respondents and move the Court that, as a part of its judgment to be entered in accordance with the memorandum opinion delivered by the Court on the 12th day of June, 1939, the Court grant a stay of its judgment pending the final determination of this cause on appeal, and as grounds for said motion, say:

I.

Said judgment should be stayed because the effect of the judgment will be to destroy, and not to preserve, the *status quo*. By granting a stay of said judgment, the *status quo* will be preserved until the validity of the proration orders of the Railroad Commission can be finally determined by the Appellate Courts.

II.

Said judgment should be stayed because a state of great uncertainty and confusion in the East Texas Field generally will be prevented by staying said judgment. No operator in the East Texas Field will know what his rights are until this cause is finally decided on appeal. In the meantime, many operators will feel that they are being

72 unfairly treated if the complainant is allowed to produce an amount of oil in excess of the amount allowed under the present proration orders of the Railroad Commission, while the remaining operators in the field are restricted to the amount allowed under the present order. There will almost certainly be a great number of suits by operators desiring to receive the same privileges as complainant, unless by a stay of this judg-

ment the rights of all parties are preserved *in statu quo*. Such lawsuits will only lead to unnecessary expense, uncertainty and confusion. If a stay is refused, there will be no practical way of granting equal treatment to all operators in the field, because there will be no proration method which can be enforced against all of the operators in the field. The Court has not indicated what method of proration would be enforceable, and the Railroad Commission is not free to adopt a different method of proration without forfeiting its right of appeal. Respondents cannot substantially amend said proration orders pending an appeal, for the reason that said appeal would thereby be rendered moot, and respondents would in effect be deprived of their right of appeal.

III.

Respondents further say that unless a stay is granted by the Court, respondents will in large measure be deprived of their right of appeal and the effectiveness of the judgment of the Appellate Court, in the event the judgment of this Court is reversed and the proration order of the Railroad Commission is upheld, will be to a large extent destroyed.

IV.

The complainant will not suffer any irreparable injury from a continuation of the present method of proration during the time which will be necessary for the respondents to appeal this case and have the case finally determined by the Circuit Court of Appeals and the
 73 Supreme Court of the United States. The evidence in this case shows that the present method of proration has been in effect in the East Texas field for over six years, and that it was in effect for over five years prior to the filing of this suit by the complainant. In this

case the complainant did not press its prayer for interlocutory relief and was content to have the case heard about six months after the filing of the suit, on its prayer for a permanent injunction. The evidence in this case shows that the rate of withdrawal of oil from the East Texas Field under the present method of proration is comparatively slow, and negatives the idea that the complainant will suffer any substantial injury during the time that will elapse before the case can finally determined on appeal. In this connection the respondents say that they will give notice of appeal and that they will promptly press their appeal to the Circuit Court of Appeals and to the Supreme Court of the United States in order to obtain a speedy determination of their appeal. Respondents show that they have at no time asked for a continuance or a delay in the termination of this case, and that this prayer for a stay is not asked for any purpose of harrassing or injuring the complainant in any way.

V.

Any injury which may result to the complainant as a result of the stay of the judgment entered by the Court in this case will be greatly outweighed by the injury which will be done to the respondents and to the operators in the East Texas Field and throughout the State of Texas as a whole as a result of the confusion, uncertainty, and expense which will be caused if the complainant is allowed to produce a greater amount of oil than the remaining operators in the East Texas Field, pending the final determination of this case on appeal.

VI.

Respondents further say that no bond should be required of respondents as a condition to the granting of a stay of the judgment in this cause, because respondents have

acted purely in their official capacities, in good faith, and without discriminating between complainant and others similarly situated, and it would be unjust to require them to submit to personal liability as a condition of obtaining a stay of the judgment where the appeal can be effective only if a stay is granted.

Wherefore, respondents pray that this Court by its judgment stay the operation of any injunctive relief granted against respondents, pending a final determination of the appeal to be taken by respondents from said judgment, and that no supersedeas bond be required of respondents, and for such other relief as may be proper in the premises.

GERALD C. MANN,

Attorney General of Texas.

JAMES P. HART,

Assistant Attorney General.

D. D. MAHON,

Assistant Attorney General.

HARRY S. POLLARD,

Attorneys for Respondents.

Address: State Capitol, Austin, Texas.

Service of a copy of the foregoing motion was made by me by delivering said copy to Hon. J. B. Robertson at the office of Greenwood, Moody & Robertson, attorneys for complainant, in the Norwood Building, in Austin, Texas, at 11:40 A. M. on this 13th day of June, 1939.

JAMES P. HART,

Attorney for Respondents.

Motion To Stay Judgment Original. Filed 13th day of June, 1939.

ORDER OVERRULING MOTION FOR STAY OF JUDGMENT.

75

(Title Omitted.)

On this the 14th day of June, 1939, came on to be heard the motion of Respondents for a stay of judgment in this suit pending appeal, and the Court having heard and considered the same is of opinion that it should be overruled, and accordingly Respondents' motion for stay of judgment pending appeal is in all things overruled and denied.

ROBERT J. McMILLAN,

Judge United States District
Court, Western District of
Texas.

Entered: Eq. Min. Vol. G, page 463.

Order Overruling Motion For Stay Of Judgment. Filed
14th day of June, 1939.

76

NOTICE OF APPEAL.

No. 624 In Equity.

In the District Court of the United States For the Western
District of Texas, Austin Division.

Rowan & Nichols Oil Company, Complainant,

vs.

Railroad Commission of Texas, Lon A. Smith, Ernest O.
Thompson, Jerry Sadler, and Gerald C. Mann, Re-
spondents.

Notice is hereby given that the Railroad Commission of Texas and Lon A. Smith, Ernest O. Thompson and Jerry Sadler, Members of the Railroad Commission of Texas, and Gerald C. Mann, Attorney General of Texas, respondents above named, hereby appeal to the United States Circuit Court of Appeals for the Fifth Circuit from the

final judgment entered in this action on the 14th day of June, 1939.

Dated this 19th day of June, 1939.

(Sgd.) GERALD C. MANN,
Attorney General of Texas.

(Sgd.) JAMES P. HART,
Assistant Attorney General.

(Sgd.) D. D. MAHON,
Assistant Attorney General.

(Sgd.) HARRY S. POLLARD,
Attorneys for Respondents.

Address: State Capitol, Austin, Texas,

77 Notice Of Appeal Original. Filed 19th day of June, 1939.

78

APPEAL BOND.

(Title Omitted.)

Know all men by these presents that we, the Railroad Commission of Texas, acting herein by and through Lon A. Smith, Chairman of the Railroad Commission of Texas, who is hereunto duly authorized, and Lon A. Smith, Ernest Q. Thompson, and Jerry Sadler, Members of the Railroad Commission of Texas, and Gerald C. Mann, Attorney General of Texas, as principals, and American Surety Company of New York, a corporation, of New York, duly authorized to become surety upon judicial bonds, as surety, are held and firmly bound unto Rowan & Nichois Oil Company, the above named complainant, its successors and assigns, in the penal sum of Two Hundred and Fifty Dollars (\$250.00) to be paid by the said Railroad Commission of Texas, Lon A. Smith, Ernest O. Thompson, Jerry Sadler, and Gerald C. Mann, for the payment of which well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The condition of the foregoing obligation is such that,

79 Whereas, the above bounden Railroad Commission of Texas, and Lon A. Smith, Ernest O. Thompson, Jerry Sadler, and Gerald C. Mann, have given notice of appeal to the United States Circuit Court of Appeals for the Fifth Circuit from the final judgment entered in the above entitled and numbered cause by the District Court of the United States for the Western District of Texas, Austin Division, on the 14th day of June, 1939;

Now, Therefore, if said Railroad Commission of Texas, and said Lon A. Smith, Ernest O. Thompson, and Jerry Sadler, and Gerald C. Mann, shall prosecute said appeal to final effect and shall pay all costs if they fail to make their plea good or if their appeal is dismissed or said judgment affirmed or such costs as the Appellate Court may award if said judgment is modified, then this obligation shall be void, otherwise to remain in full force and effect.

Dated this 19th day of June, 1939.

RAILROAD COMMISSION OF
TEXAS,

By LON A. SMITH,
Chairman.

(Sgd.) LON A. SMITH,

(Sgd.) ERNEST O. THOMPSON,

(Sgd.) JERRY SADLER,

(Sgd.) GERALD C. MANN,

Principals.

AMERICAN SURETY COM-
PANY OF NEW YORK,

Security.

By W. T. DECHERD,
Resident Vice President.

(Seal)

Attest:

S. C. LINSOMB,
Resident Assistant Secretary.

Appeal Bond Original. Filed 19th of June, 1939.

80

CLERK'S CERTIFICATE.

The United States of America,
Western District of Texas, ss.

I, MAXEY HART, Clerk of the United States District Court in and for the Western District of Texas, do hereby certify that the foregoing on 79 pages is a true and correct transcript of a portion of the proceedings had and orders entered, as therein stated, in Cause No. 624 In Equity, styled Rowan & Nichols Oil Company versus Railroad Commission of Texas, et al, as the same appear on file and of record in this office.

I further certify that said transcript embraces only such pleadings, process and orders as are specified in the praecipe filed herein by Appellants.

Witness my official signature and the seal of said District Court, at office in the City of Austin, Texas, this the 20th day of June, A. D. 1939.

MAXEY HART,

(Seal)

Clerk of said Court.

By JOE STEINER,

Deputy.

STATEMENT OF EVIDENCE.

(Question & Answer Form)

5

(Title Omitted.)

Be It Remembered, that the Complainant above named came into the District Court of the United States for the Western District of Texas, Austin Division, and sued the Respondent above named, and the Respondent appeared and filed answer; and thereupon issues were joined between them; and afterward, to-wit, at a session of said Court held in the City of Austin, before the Hon. Robert J. McMillan, Judge of said United States District Court for the Western District of Texas, on the 6th day of February, A. D. 1939, the issues between the said parties came on to be heard. Complainant being represented by Rice M. Tilley, Esquire, Hon. Dan Moody and Phillip Tocker, Esquire; and Respondent being represented by Hon. James P. Hart and Hon. D. D. Mahon, Assistants to the Attorney General of Texas, and Harry Pollard, Esquire.

Whereupon, during the course of the trial the following evidence was adduced and proceedings had, Viz:

6

A. H. ROWAN, called as a witness on behalf of the Complainant, having been first duly sworn, testified as follows, to-wit:

Direct Examination.

Questions by Mr. Tilley:

Q.. Your name is A. H. Rowan, and you reside in Fort Worth, Texas?

A. Yes, sir.

Q. And you are an officer of the Rowan & Nichols Oil Company a corporation?

A. Yes, sir.

Q. What is your office?

A. President.

Q. Mr. Rowan, does your company own any production in the East Texas field?

A. Yes, sir.

Q. Where?

A. Two leases on the B. C. Todd, Castleberry Survey, W. H. Castleberry Survey, in Gregg County.

Q. How much acreage do you have in the B Lease?

A. Twenty-five.

Q. How many wells?

A. Five wells.

Q. Did you drill those wells in accordance with the spacing rules and regulations of the Railroad Commission?

A. Yes, sir.

Q. From time to time?

A. Yes, sir.

7 Q. You have a statement there as to the dates on which those wells were completed?

A. Yes, sir.

Q. Will you hand that to me and let us have it identified as an exhibit?

A. Yes, sir.

Q. Did you drill those wells at such times and such locations as you thought would reasonably protect your property?

A. Yes, sir.

Q. Are they enumerated in here, the dates of beginning and completion?

A. Yes, sir.

Q. Did you also enumerate in here the amount of production from those wells?

A. Yes, sir, it is enumerated by years, and then the total cumulative production as of January 1, 1939.

Q. And what is the average per acre?

A. I think the average is around fourteen thousand per acre.

Q. Mr. Rowan, how long have you been in the oil business?

A. For myself since January 1, 1924.

Q. What kind of business have you been engaged in in connection with the oil business?

A. I have two compaines. One is a drilling contracting company where I drill wells for others on contract; and I have production in this oil company.

Q. Do you in your drilling business go out on the wells and supervise them?

A. Yes, sir.

Q. You are a drilling contractor yourself by
8 trade?

A. Yes, sir.

Q. You have your own production, I believe you stated?

A. Yes, sir.

Q. What fields have you drilled wells in generally throughout the State?

A. Yes, sir, we have drilled wells in the Gulf Coast and Southwest Texas along what is known as the Fault Line fields and Corsicana. Mexia, the Permian Basin and New Mexico and East Texas and wildcat territories throughout the State.

Q. How many wells did you drill, approximately, in East Texas?

A. I don't know the exact number, but I think over a hundred.

Q. Did you ever examine the cores in those wells, or some of those cores?

A. Yes, sir, I have examined the cores from numerous wells.

Q. Do you know how to analyse a core as an oil man would?

A. You mean make a laboratory test?

Q. I mean to determine if it is an oil sand core, to determine within a reasonable degree its permeability or porosity?

A. I think my experience looking at cores and observing the action of the well after it has been brought in gives me a fairly good knowledge of what to expect after looking at the core, yes, sir.

Q. Do you personally supervise the drilling of those wells in East Texas?

A. Yes, sir.

Q. Now, with reference to your production experience, have you yourself participated in or supervised the operations of the production of the oil of any tracts in the East Texas field?

A. I have on both those tracts that we have production on from the time we got our first oil.

Q. Did you ever personally ever supervise any potentials taken on any of those wells over there?

A. Yes, sir.

Q. Now, Mr. Rowan, do you read a lot about drilling, about the drilling of oil wells and production practices?

A. Yes, sir, I read as much as I have time to read and what I can get my hands on.

Q. Have you attended to any marked extent proration hearings before the Railroad Commission at which the problems of the East Texas field were discussed, engineering problems and underground conditions, and those things?

A. Yes, sir, on numerous occasions.

Q. Are you fairly familiar with those problems?

A. I think I am, yes, sir.

Q. Are you on any committees of the American Petroleum Institute, or have you been on any of them for the purpose of studying those problems of drilling and production?

A. No, I never have been on any committees like that that I remember of.

Q. Or any other associations?

A. I am a member of the American Petroleum Institute.

Q. You have been on committees, but not for that purpose?

A. I have appeared before committees and entered discussions, but I don't remember ever being a committee member.

Q. Have you had occasion to talk to numerous engineers and geologists who have made a minute study of the problems of the East Texas field?

A. On numerous occasions.

Q. Do you feel your experience and knowledge qualifies you to some extent to determine within a reasonable degree of accuracy the conditions in the East Texas field such as sand thicknesses and to interpret bottom hole pressure and potential as the same is taken or might otherwise be taken?

A. Yes, sir, I think I do.

Q. The permeability and porosity?

A. I wouldn't say I would make a permeability or porosity test, I wouldn't say I could unless I had the laboratory, a laboratory equipped to do it. I can look at a core and tell you my idea of its permeability or porosity.

Q. It wouldn't be as accurate as a laboratory test?

A. No, sir.

Q. Have you analysed cores and later seen a laboratory test of those cores and marked any degree or lack of degree of accuracy between the two?

A. As far as permeability is concerned?

Q. Yes, or porosity?

A. No, sir, I don't believe I have ever made these comparisons in my own mind, Mr. Tilley, as to what estimate I would place on it and what would be placed on it by the laboratory.

Q. I believe you stated you could tell within a reasonable degree the permeability or porosity by examining the core?

11 A. I think I can look at a sand and tell whether it is tight or loose, and that is what permeability is.

Q. What would you say the variation is between the poorest potential in the East Texas field and the best, under open flow conditions?

A. Well, you mean now?

Q. Now.

A. There is wells in the field that, I guess, won't pump over five or six barrels a day, and I believe there are wells in the field right now that will make between twenty and twenty-five thousand barrels of oil a day on short tests, such as was taken to establish the potential contours.

Q. All right, how much would you say your well would produce today under open flow production?

A. My guess would be somewhere in the neighborhood of nine hundred barrels per hour.

Q. I asked you open flow?

A. Open flow, yes, sir, that is, I am making my estimate now based on the method that was used by the Railroad Commission in establishing those contour lines, using that same method.

Q. If you should let your well run wide open today, what do you estimate would be the twenty-four hour yield of that well?

A. I don't know.

Q. Can you estimate it?

A. You mean let it flow for twenty-four hours?

Q. Yes, sir.

A. Well, the only estimate I can make on it is the performance that we observed at the time that we took the potential test on it.

12 Q. Yes.

A. And my recollection is that was a three hour test. My recollection is that the third hour was practically the same as the first or the second hour test, that there was not any dropping off. Consequently, I would say, in the absence of any other information to the contrary, that the well might keep on flowing that way for twenty-four hours.

Q. Well, now, what would that be, the approximate amount of oil per day that would produce, per day, open flow?

A. That would be a little over twenty thousand barrels.

Q. Now, is that among the best wells in the field, where your wells are?

A. Yes, sir, it ranges right up to the top. There are wells that have shown a higher potential than that well.

Q. Well, how many wells are there in the field all together?

A. According to the schedules that the Railroad Commission published on January 1st, there were about 25,900.

Q. How many wells would you say there are over there that would top your potential, open flow potential, per day?

A. I have a computation. There are about five hundred wells.

Q. About five hundred wells out of almost twenty-six thousand?

A. That is right, yes, sir, that are accorded a slightly higher allowable than mine.

Q. Does that mean they could produce more than yours?

A. I don't think so, Mr. Tilley. I think if my well was drilled into the sand as far as some of those wells were that were tested, and if it was tested under the same circumstances as these other wells, I think my well would produce as much oil on potential as any well in the field.

Q. All right, let's get back to the time that the potential map was promulgated by the Commission. Now, that map has not been corrected, I believe, by new potentials being taken?

A. I think there has been some correction made from time to time.

Q. But new potentials have not been taken over the field?

A. Not over the entire field.

Q. Now, Mr. Rowan, what was the—what do you estimate—

A. There have been a few wells tested.

Q. What do you estimate to have been the daily potential open flow of your well at the time this potential map was promulgated?

A. You mean if all the conditions were the ideal conditions, if I drilled it into the sand as deep as I could drill it in there, drilled clear through the sand and had no back pressure on top of the well head?

Q. That is right.

A. I think the well probably would produce eleven hundred barrels.

Q. An hour?

A. Yes, sir.

Q. Multiply that by twenty-four and you would have approximately what?

A. That would be 26,400 barrels per day.

Q. Now, do you think at that time that that was probably the best or about the best well in the field?

14 A. Using seven inch casing, yes, sir. There are wells in the field with bigger casing that have made higher potentials than that due to the fact that they had larger casing, but with a seven inch casing that is about as big as I know anything about.

Q. Now, Mr. Rowan, a test was made on your property, was it not?

A. Yes, sir.

Q. On what well on what lease?

A. It was made on A Lease, Well No. 3, as well as I remember.

Q. Mr. Gordon Griffin, was he there at the time.

A. He was the resident engineer for the Railroad Commission at Kilgore, and observed the test.

Q. He is in the Courtroom now?

A. Yes, sir.

Q. He was with you when you took that potential, and supervised it?

A. Yes, sir.

Q. What did that potential show?

A. On a three hour test it showed the average of the last two hours to be 964 barrels per hour.

Q. Could you have so equipped that well and your tanks and flow lines as to have exceeded that?

A. No, I don't think so, Mr. Tilley.

Q. Well, did you have any back pressure on the well?

A. Yes, sir, had about thirty pounds.

Q. Explain to the Judge what back pressure is, what you mean by back pressure?

A. It is the pressure on top of the Christmas tree of the well that is retarding the flow or retarding the oil, to keep it from getting away from the well head.

Q. How did you flow that well?

A. I flowed it through two four inch lines out of the casing head, and I believe there was one four inch line out of the tubing head.

Q. Did those four inch lines constitute a back pressure factor?

A. Yes, sir, they constituted some back pressure factor.

Q. Where was your tank situated?

A. The tank was situated pretty close to the well, about as close as we could get it to the well without having it right up against the well.

Q. Was it below or above the level of the head of the well?

A. Above it.

Q. How much.

A. The top of the tank was about, and we were flowing one line into about the middle of the tank, and the other two to the top, about twenty-two feet—about sixteen feet.

Q. Could an engineer make a calculation to make an adjustment for that back pressure to give you a higher allowable?

A. I think so.

Q. Did the Commission do it?

A. No.

Q. Now, were there other wells—there were potentials of other wells taken throughout the field?

A. Yes, sir.

Q. Were some of those potentials made into tanks which were below the head of the well?

A. That is correct.

16 Q. What does that demonstrate?

A. Those wells had a higher potential and they had a lower back pressure on the well. Some of those wells had as low as ten pounds back pressure.

Q. Now, that gave that well, then, an advantage over your well?

A. It gave it an advantage, yes, sir, in setting the allowable.

Q. Was that real?

A. I don't think so, no, sir.

Q. I mean was it substantial?

A. The test showed it had more, but I don't think it meant that well would produce, that particular well would produce any more oil than mine.

Q. Did the Commission make any adjustment for that situation?

A. No, sir.

Q. What happened when you took this open flow test there for a three hour period, and what time of the morning did you take it?

A. Started flowing the well about 7:00 o'clock in the morning, and we had taken these connections and turned them into the tank, a thousand barrel tank which was sitting by the side of the well. Manhole or vent on top of the tank was taken off and the oil was permitted to flow into that tank without going through the separator, and the gas came out at the top of the tank and there was a gentle breeze blowing from the south, and that gas went up a valley like a smoke for at least half a mile, and possibly farther. It was a very wet gas, of

17 course, and we sent men out in cars to warn everybody in the houses to put out their lights and fires and to try to stop all automobiles and anything of that nature from getting into this valley where this wet gas was hanging, so as to prevent a fire, because if that gas had become ignited at any point, even half a mile from the well, that flame would have followed the gas on up the valley and ignited the tank, and the well being flown, it would have been practically impossible to shut the flow down.

Q. Did you place in jeopardy the lives of your men by taking that test?

A. I kept them away from the well during the time that it was flowing, and the only time that I let them go on the tank was when we had to gauge it to get the hourly rate, and then, of course, we had to go to close it, and if a fire had occurred at any one of those times, why, lives of course would have been lost.

Q. Is it very dangerous to take such a test as that?

A. Yes, sir, I think it is the most dangerous thing I ever saw done in an oil field.

Q. Did Mr. Griffin tell you he thought so also?

A. Yes, sir.

Q. Now, Mr. Rowan, let's come to your test. Before I get off of that, what is the daily allowable at the present time fixed by the Railroad Commission?

A. The total?

Q. Yes.

A. Slightly over 522,000 barrels.

Q. And you produce how many days a week?

18 A. Five days a week.

Q. What is the actual daily allowable for the producing days?

A. I think it is around 373,000 barrels on a seven day average.

Q. Now, Mr. Rowan, I believe you stated that your well, for instance, would produce 22,000 barrels a day. What is your allowable for those wells, per well?

A. The allowable per well?

Q. Yes, sir.

A. Slightly over twenty-two barrels.

Q. Per day?

A. Yes, sir.

Q. Now, what does the poorest well in the field get, if it can make twenty barrels?

A. It gets twenty barrels.

Q. What would a well on 1/100th of an acre—and, by the way, are there wells over there on as little as 5 100ths of an acre?

A. That is a half acre?

Q. No. That is one twentieth of an acre.

A. Yes, sir.

Q. Are there numerous such wells?

A. Yes, sir.

Q. Now, does one of those wells on a twentieth of an acre, situated favorably on the structure—situated on the poorest part of the structure—get practically the same allowable as you?

A. Yes, sir, if his well will make twenty barrels, he does.

Q. If it will make twenty barrels?

19 A. Yes, sir.

Q. Now, tell the Court about the Wood well which is right next to you?

A. The R. M. Wood well is situated just to the south of my No. 1 well. It is located on a strip of ground which they claim is an acre. My engineer claims it is one tenth of an acre.

Q. All right. Now, under the present allowable order what is your average per acre allowable per day—what is that?

A. Average per acre 4.48 barrels per acre.

Q. About four and a half barrels per acre?

A. Yes, sir.

Q. All right, now, how much is Mr. Wood getting per acre, right next to you?

A. He is getting about 220, (a little over 220 barrels per acre per day.

Q. It averages four and a half for you to 250 an acre for him?

A. 220.

Q. Now, are the sand conditions the same under your lease as under his?

A. Yes, sir.

Q. Is that right?

A. Yes, sir.

Q. They give him the same potential that they give you?

A. Yes, sir. That estimate on 220 barrels per day per acre is assuming, of course, his acreage to be one tenth, which my engineer says it is.

Q. Now, if the Railroad Commission says that the potentials represent in any reasonable degree recoverable oil under a lease over there, have they given any consideration to it in the Wood case?

20

A. No, sir.

Q. Have they given any consideration to it on any other small tract that you know of?

A. No, sir.

Q. Now, you say that you are familiar with the East Texas field generally?

A. Yes, sir, I think I am. I have drilled wells all over there.

Q. Now, what do they call the Fairway over there?

A. The Fairway is an expression that is used by oil men which denotes the approximate one-third center of the field, running north and south.

Q. Well, before we get to that, Mr. Rowan, have you examined the potential map that we are talking about?

A. I have seen a Railroad Commission potential map, yes, sir.

Q. That map gives you a potential of 960 barrels a day, I believe you stated?

A. 964 on some wells; 960 on others; 970 on some.

Q. That is per hour?

A. Yes, sir.

Q. Now, your allowable is based on that, of course?

A. Yes, sir.

Q. And that is twenty-two plus per day, you stated?

A. Yes, sir, twenty-two barrels and a fraction barrels.

Q. What did the Commission do when they got over to the east side, did they take potentials over there?

A. There is large areas in there they didn't
21 take any potentials at all, they just took a potential on a well maybe a mile or a mile and a half from the eastern limits of the field and then drew imaginary contour lines in from that well. For instance, if they had a well on the east side that would make 600 barrels they just equally spaced their contour lines from there to the eastern limits of the field and drew them in at hundred foot contours.

Q. When did they start the 600 potential contour lines?

A. They would start that—any line they made would have to start at a point where they took a potential on a well.

Q. Well, I meant 600 hundred barrels instead of 600 feet.

Mr. Moody:

He meant hundred barrel contour lines.

Q. You meant that?

A. Yes, sir.

Q. Are you familiar with the area over there where the 600 barrel contour begins and goes over until it feathers out on the eastern side?

A. I am from observing the Railroad Commission map, yes, sir, from observing the Railroad Commission contour map.

Q. Those wells are given twenty barrels, if they will make it, pumping or flowing?

A. Yes, sir.

Q. All right, how does your ability to produce compare with that of those wells?

A. Well, a pumping well on the east side, it wouldn't make but twenty-one barrels a day, one that wouldn't make but that would be given twenty barrels, as
22 opposed to my well which has a Railroad Commission acknowledgment, an acknowledged potential of 964 barrels, and it is only given slightly over twenty-two barrels.

Q. Those wells which are given a potential from 600 to 200 barrels per hour, will they actually produce that?

A. A great many won't and never would, wouldn't at the time the map was made.

Q. Now, let's get back to the Fairway or position on the structure—what do you mean by position on the structure?

A. Position on the structure, as the term is used by oil men, usually means the highest part of the structure or the most favorable part of the structure with reference to sand thickness.

Q. Now, describe the East Texas field in reference to sand conditions, the water table, and how the sand feathers out on the eastern side, just describe the field to the Court generally?

A. It is a shoreline field, the sand is laid down up against what is known as the Sabine Uplift. Its thickness on the eastern edge is from nothing, I would say, and gradually becomes thicker as it goes to the west or towards the Woodbine Basin west of the eastern limits of the field. The western part of the field is underlain with water. The eastern part doesn't have any water under it. The thickest saturated sand section of the field is down through the middle of the field.

Q. Now, is gas free or in solution over there.

A. My understanding is it is in solution.

23 Q. All right. Now, what is the lifting energy over there?

A. The lifting energy is the water drive.

Q. Does the gas in solution have anything to do with that?

A. I think it helps, yes, sir.

Q. How?

A. Well, as the oil is raised up in the hole the expansion of gas helps to lift the fluid from a certain portion in the hole out to the surface.

Q. Is your lease on or off the Fairway.

A. My lease is on the Fairway.

Q. How many acres of leases over there embrace what is commonly referred to as the Fairway?

A. Well, my estimate on it would be about a third of the acreage would be in the Fairway.

Q. You mean a third of the acre feet of sand?

A. I don't understand your question.

Q. When you say a third are you referring to acre feet of sand or referring to your surface?

A. On the leases?

Q. Yes.

A. A third of the leases. That is not in total number of leases, but a third of the total acres of the field.

Q. Surface acreage?

A. Surface acreage in the field, is what I would term the Fairway.

Q. Now, where are you situated with reference to the Fairway?

A. I am in the Fairway.

Q. Right in the middle of it?

A. I wouldn't say exactly in the middle, but
24 I am in the—it depends on where you place that fine line of demarkation.

Q. Is that where the sand is thickest or not thickest?

A. The sand is thickest in the Fairway.

Q. Describe to the Court what advantage; or whether or not there is any advantage with reference to being on the Fairway?

A. The advantage is in that you have the thickest sand, and by virtue of having the thickest sand you should have more recoverable oil. You have more recoverable oil in place under those tracts that are in the Fairway.

Q. Now, under open flow conditions, Mr. Rowan, would the Fairway have any advantage over the east or west side of the field?

A. Yes, sir, it would have a very decided advantage.

Q. Why?

A. Because the recovery would be greatest and the flowing life would be long after the west side had been drowned out by the water and the east side had been put on the pump.

Q. Now, how do the bottom hole pressures on the Fairway compare with those on the east side?

A. Right now?

Q. Right now?

A. The bottom hole pressures are the smallest on the east side and highest on the west side. That is due to the water energy coming from the west.

Q. Now, Mr. Rowan—

A. In the middle of the field you are in a comparable position.

Q. Now, Mr. Rowan, under proration what advantage, if any, will the east have on the Fairway or the Fairway have over the eastern side of the field?

25 A. Ask that question again, Mr. Tilley.

Q. Under the present plan of proration, or under any plan of proration—

Mr. Tilley:

I withdraw that question.

Q. Under a per well plan of proration what advantage, if any, would the east side of the field have over the Fairway, or visa versa?

A. It will have a very decided advantage over the Fairway.

Q. That is under a per well plan?

A. That is under a per well plan, yes, sir.

Q. Why?

A. Well, it will get many times more oil than was originally under that portion of the structure.

Q. Why?

A. Because on equal withdrawals the oil is migrating from the west to the east, and most of your oil is in place under the middle of the structure. Consequently, if you are drawing it out on a per well basis, and assuming that the field is drilled up to a uniform pattern, the man in the middle of the field would lose his oil because it would migrate, up-dip to the east.

Q. In other words, if somebody would take you hunting and drive deer by you, but hold your gun, it wouldn't do any good?

A. No, sir.

Q. Is that it?

A. Yes, sir.

26 (At this time a recess was taken, at the conclusion of which the following proceedings were had:)

Q. Now, Mr. Rowan, you, of course, are familiar with the area generally around your leases?

A. Yes, sir.

Q. I will ask you whether or not, just arbitrarily taking an area eight times the size of your lease, as to whether or not that area is the same or practically the same or is not practically the same density as your lease?

A. I think so, yes, sir.

Q. Now, the fact that that density does exist, does that in any way affect the amount of oil that is either under or that will be ultimately recovered from your tract, if outside of that area there is a more greatly and densely drilled area?

A. I think it doesn't indicate how much oil I have under my tract, but I think it affects the recovery from my tract by virtue that there might be—I might have the same drilling density within an area eight times, and within an area nine times or ten times, it might be drilled at a lot denser than that, and I would loose some oil.

Q. The East Texas field is a common reservoir, is it not?

A. Yes, sir.

Q. Well, if there were very densely areas just outside this eight times area of your lease, would that densely drilled area, being prorated on the present plan, would

that tend to deprive you of getting your fair share of the oil, the oil estimated to be under your land, or the equivalent thereof?

27 A. Yes, sir, it would.

Q. Now, Mr. Rowan, have you and your engineers estimated what the per acre recovery is over there under your tract?

A. Yes, sir.

Q. What is it?

A. Originally or now?

Q. Both?

A. Originally it was slightly over 60,000 barrels per acre. At the present time it is about 46,000 barrels per acre on the B Lease.

Q. You mean that was the amount of oil under your land at that time and under your land now?

A. That is correct.

Q. We are not talking about what can be recovered under the present plan, we are talking about what is under there now?

A. That is correct.

Q. That is what your figures testify to?

A. Yes, sir.

Q. How does that compare with the rest of the East Texas field?

A. On a percentage basis?

Q. No, sir; with reference to whether or not it is good or poor or the best in the field, or what?

A. Well, it is considerably better than the average.

Q. Considerably better?

A. Yes, sir, considerably better than the average.

Q. Now, have you estimated the recoverable oil under the entire East Texas field?

A. Yes, sir.

28 Q. Have you prepared a schedule to show—that is, have you made an investigation and determined what that is, how much recoverable oil there is in the East Texas field at the present time?

A. Our computations show that there is left in the reservoir at this time 2,217,980,000.

Q. Do you have an extra copy of that for the Court?

A. Yes, sir (passing paper to the Court).

Mr. Hart:

May I see that if you are going to introduce it in evidence?

Mr. Tilley:

You can see it, Mr. Hart; but it is just a memorandum he prepared after this computation.

Mr. Hart:

Do you have a copy of it?

Mr. Tilley:

No.

The Witness:

Here is a copy (handing same to counsel).

Q. Now, how much do you estimate you now have, barrels in place under your lease?

A. At the present time 1,151,168.

Q. What is your present daily allowable under the present plan of production?

A. 111.83 barrels.

Q. Now, if you would produce under the present plan, Mr. Rowan, how many days would it take you to recover that oil?

A. It would take me 10,278 days.

Q. I noted the tabulation shows 10,278?

A. It should be 10,278 days.

Q. Now, how many years at 365 days each, producing days, would it take to produce that oil?

A. 28.1.

Q. How many five days a week?

A. 39.3.

Q. Now, you said a while ago, I believe, that the total recoverable oil was 2,217,980,000?

A. Yes, sir, correct.

Q. What is the number of days it would take to recover all of the oil under the present allowable?

A. 4,240 days.

Q. Now, at 365 days a year?

A. It would take 11.35 years.

Q. All right, then, while the field would only take eleven years to be depleted, in order to get your oil your figures show it would have to produce twenty-eight years, or more than twice as long?

A. Yes.

Q. Two and one-half times as long?

A. Yes, sir, that is correct.

Q. In other words, when the field is depleted, you still haven't got near your oil?

A. That is correct.

Q. Now, at five days a week, 261 producing days, how long would it take to get all of the producing oil?

A. 16.26 years.

Q. For the field?

A. Yes, sir.

Q. Now, compare that with the number of 30 years it would take you to get your oil?

A. It would take 39.3 years, producing only five days a week, using the present rate of flow and allowable, to my lease to get me the equivalent of my estimated recoverable reserves out.

Q. I believe you have given the figure of the ultimate recovery of the field?

A. Yes, sir.

Q. And the production to date has been how much, and what percentage?

A. We estimated the total recoverable oil in the reservoir originally as 3,522,710,352 barrels, which is a hundred per cent. The production to January 1st, 1939, is 1,304,730,000, or 37.04 per cent of the total recoverable has been taken out of the reservoir to date.

Q. Now, Mr. Rowan, do you have an analysis there which is handy to show—well, I believe you show it there, subsequently, don't you? Just explain the rest of the figures with reference to the ultimate recovery of your lease and production of your lease in percentages?

A. We estimate the ultimate recovery of our lease originally as 1,506,422 barrels. Our production to January 1st, 1939, has been 355,254 barrels, or 23.58 per cent.

Q. All right. Now, have you suffered in reference to percentages there as compared with the rest of the field?

A. I have lost about fourteen per cent.

Q. In other words, the rest of the field has produced thirty-seven per cent, whereas, you have only
31 produced only twenty-three per cent plus?

A. That is correct.

Q. What is the average Woodbine section over there in the field?

A. We compute it at forty-two feet.

Q. Have you computed the net sand?

A. About twenty-eight feet.

Q. Now, what is the Woodbine section there?

A. The Woodbine sand section on our lease is ninety-five feet.

Q. All right, what is the net sand under your lease?

A. Sixty-five feet.

The Court:

What do you mean by the net sand?

The Witness:

That is the clean—that is the saturated sand, taking out the shale and ash and taking out the impervious particles that are in the sand.

Q. Now, you have prepared a formula there, Mr. Rowan. Will you explain that to the Court?

A. This formula takes into consideration the—it wasn't prepared by me; it was prepared by my engineer—it takes into consideration the necessary factors such as percentages of recoverable oil and the porosity and water in the oil, and one thing and another. It shows a net of 927 barrels per acre.

The Court:

This copy I have here has a pencil mark on it 885. Which is right.

The Witness:

927.

Q. You mean per acre foot, Mr. Rowan?

A. Per acre foot, yes, sir.

32 Q. Now, do you remember off-hand what the per acre foot is for the whole Woodbine section?

A. We use the same basis of recovery per acre foot on the whole field as we did on our lease, notwithstanding that we think our lease has a character of sand that is as fine as there is in the whole field, on a basis of its yield.

Q. How did the Todd reserve then compare with the total of the field, in what percentage?

A. The percentage .004276.

Q. On those figures, then, what has been your loss to date?

A. Had we taken a percentage of .004276 times the production to date, which was 1,304,730,000 barrels, we would have produced 202,648 barrels more than we actually produced under the allowable as set by the Railroad Commission.

Q. Now, Mr. Rowan, have you been before the Railroad Commission before to try to get them to give you what you say your fair share of the oil is?

A. Yes, sir, pretty nearly every year for the last seven years.

Q. How long, for about seven years?

A. Yes, sir.

Q. Is this anything new as between you and the Commission?

A. No, sir; I have asked them on numerous occasions to make an adjustment.

Q. You have gone before the Commission and testified for over six years?

A. Yes, sir.

Q. Now, have you been to Court over the matter?

A. Yes, sir, this is the third law suit I have
33 filed.

Q. You tried one case in Houston in which the order was declared invalid?

A. Yes, sir.

Q. And another in Fort Worth in which a temporary injunction was denied?

A. Yes, sir.

Q. That injunction was denied—what was the relative comparison between the allowable for the best well and the twenty barrel wells?

A. Well, I think at that time, Mr. Tilley, there was a minimum allowance of forty barrels per well, and I don't remember what the allowable was on my well. It was something better than that, of course, but I think we had a minimum of forty barrels per well at that time.

Q. Well, were you or were you not prejudiced more by that plan than you are under the present one with the number of wells that have been drilled?

A. I am prejudiced now more under the present plan.

Q. Substantially?

A. Yes, sir, I believe substantially. I would say substantially more.

Q. That case was never tried on its merits, was it?

A. No, sir, it was not.

Q. Has the Commission granted you any new permits when you filed some of these suits?

A. Yes, sir, they did.

Q. Now, Mr. Rowan, you testified about the Wood tract. Where is that Wood tract, now, with reference to your lease?

A. It is right south of the southeast corner of my lease. As a matter of fact, I think it is part of my lease, although the well is not on my lease.

Q. Was it first granted on your lease?

A. Yes, sir, the first stake was driven on my lease, on land I claimed.

Q. Was it later moved?

A. Yes, sir.

Q. All right, where is the highway there where that well is located?

Mr. Hart:

If the Court please, we wish to object to that as being immaterial to any issue in this case.

The Court:

This is not a trespass case, is it?

Mr. Tilley:

There is going to be a dispute as to whether or not this is one-tenth of an acre or one acre, and I just wanted to show if it is one acre it ought not to be put on the public highway. It is probably not very material.

Mr. Hart:

Our position is that the permit was granted to Wood to drill on a one acre lease, and that permit has been sustained, and that order of the Commission is not being attacked in this case and cannot be attacked collaterally, and for the purpose of this suit we have to assume he has a well there on a one acre tract. In other words, we can't

35 go into a question of title between Mr. Wood and Mr. Rowan.

Mr. Tilley:

We submit that the Railroad Commission cannot—and the Courts have so held—we are asking for an adjustment of allowable in this case, and the adjustment can't be made unless the Court has some general idea of how much acreage the man has and what the allowables are.

The Court:

It is a trial before the Court. I think I will let the evidence in.

Q. Where is that well in reference to the highway there, Mr. Rowan?

A. The County Highway runs right along by it, within close proximity to it.

Q. Now, when did you drill your first well and take possession of that lease?

A. In 1931, I believe.

Q. Did Mr. Wood ever come out there and demand or assert any possession until that permit was granted?

A. No, sir, not that I ever heard of.

Q. When was his permit granted?

A. I don't know when his permit was granted. His well was drilled and completed about August, 1937.

Q. Well, state whether or not it was within approximately six months—

Mr. Tilley:

We can agree on that, can't we?

Mr. Hart:

On what?

Mr. Tilley:

When it was granted to Wood?

Mr. Hart:

Yes, if you state it. You have it there, I suppose?

36 Q. While he is finding that, Mr. Rowan—
August 22nd, 1937?

A. I think that is when it was completed.

Q. You had been producing oil for about six years from your lease before Mr. Wood came out there?

A. Yes, sir.

Q. Now, the Railroad Commission granted Mr. Wood, I believe you testified a while ago, or the pleadings admit, a permit on this tract and that you were granted a permit, but on motion for rehearing the case is still pending before the Railroad Commission. Now, if you were to drill that offset well that the Railroad Commission first granted you and then the motion for rehearing was granted would that give you any protection?

A. No, sir.

Q. Why?

A. Because one additional well wouldn't permit me to recover the recoverable reserves, an equivalent of the recoverable reserves, under my lease, under the present schedule of proration, as promulgated by the Railroad. I would have to drill substantially more wells in order to get my oil out before the field was depleted.

Q. How much do those wells cost you to drill them?

A. The way I would drill, around \$10,000.00.

Q. You would have to drill to his density to be equal with him?

A. Well, I don't know that that would help me even then, if everybody else drilled to that same density. I think I am going to have to have an advantage due to my position on the structure and the thickness of my sand and the reserves, based on the reserves that I have in the ground, in order to get my oil out of place before the field is finally depleted.

37

Q. At what rate was the Railroad Commission granting permits at that time?

A. Well, the first five months of this year they granted about 760 permits.

Q. You mean last year?

A. 1938, yes, sir. Pardon me.

Q. And that was during the time this permit was granted to you?

A. Yes, sir, during that period of time.

Q. If they give you that permit and grant other permits, then you will be in the same position, is that your point?

A. Yes, sir.

Q. And, yet, you would have spent all that money?

A. Yes, sir.

Q. Now, suppose you had drilled that offset, what would the other operators around there have done?

A. They would have drilled wells also, if they could have got the permits, and I guess they could.

Q. Now, Mr. Rowan, what part does the theory of offsets play in proration in such a field as the East Texas Field?

A. Well, I don't think it has any place at all in orderly development or in a proration order.

Q. If a proration plan is based on letting the operator, in preventing waste, withdraw the amount of oil that is estimated to underlay his tract, does the number of holes in the ground have anything to do with reference to that?

A. Well, I assume, Mr. Tilley, of course, that he would have to drill a well or some wells in order to get his oil out.

38 Q. Have you done that?

A. Yes, sir.

Q. What is the average density throughout the whole East Texas field?

A. One well to five acres.

Q. What is your density?

A. One well to five acres.

Q. All right, now, what is the spacing regulation over there?

A. The spacing regulation is the equivalent of one well to ten acres, 330 feet from property lines and 660 feet apart.

Q. How many acres will one well reasonably drain over there in the section of the field where you are, and throughout East Texas?

A. I think under a real conservation order where you are maintaining the bottom hole pressures and not withdrawing the oil out too fast, I think one well will drain ten acres.

Q. All right, can you withdraw the amount of oil which you assert you are entitled to with the present number of wells on your lease?

A. Yes, sir.

Q. I will ask you this question, under a plan of proration which contemplates permitting you to recover the amount of oil which is estimated to underlay your tract, can you at the same time prevent waste?

A. Yes, sir. I have known of wells over there to take all of the oil out from underneath my property. Under a conservation order which would take into consideration the factors which are necessary, and allocate the allowables to me, taking into consideration my recoverable reserves, that can be done.

Q. Could you produce your wells daily at such an amount and get that under the present allowable so as not to prevent waste?

A. Yes, sir.

Q. I mean the field allowable, of course?

A. The field allowable, yes, sir.

Q. Now, Mr. Rowan, have you made any computations here as to what you would get if this field was prorated on other plans?

A. Yes; sir, I have made some estimates.

Q. In making those estimates did you take into consideration the prevention of physical waste?

A. Yes, sir.

Q. Would those plans, a combination of those plans, permit the taking of oil over there, and especially under your tract, by you in an amount which you claim you are entitled to, could that be done without causing waste under these plans, that is, unnecessary waste?

A. Yes, sir, I think you could write an order over there, Mr. Tilley, which would prevent physical waste and would also give me substantially the oil or the equivalent of the oil which underlies my tract.

Q. And all the plants take into consideration the prevention of waste, at least to the extent of the present plan?

A. I think the prime fact in the prevention of waste over there is the top allowable, and I think you should distribute that allowable over the various leases in the field, taking into consideration the bottom hole pressure and the water table.

Q. Now, under a combination of those plans
40 would you get substantially more oil than you get under the present plan?

A. More oil per day substantially, yes, sir.

Q. Mr. Rowan, if the present plan contemplated the giving of that operator the amount of oil based on the same percentage of his potential that yours would be based on, would such a plan on the potential basis such as the Railroad Commission now uses give you or not give you substantially more oil than you are now getting?

A. Now, you mean using potentials as one of the factors or just on a straight potential?

Q. A straight potential factor, disregarding any interpretation of marginal well basis?

A. On that basis and each well given its percentage of the potential of that well and not given an arbitrary

minimum for that well, then I would get a substantially higher allowable for my wells than I am getting now.

Q. Now, Mr. Rowan, have you made a study of the densely drilled areas throughout the East Texas field or some sections of the field where there are densely drilled areas?

A. Yes, sir, I have looked at the map and looked at and read the orders of the Commission where they have granted exceptions on small tracts.

Q. What have you found from these investigations?

A. Well, I have found areas in there that are very, very densely drilled, most of those areas. It is general throughout the field that small tracts have been granted more wells than necessary to protect vested rights, but
 41 in the townsite areas of Kilgore, Gladewater and London there have been numerous wells drilled on small tracts. Also Overton.

Q. Was Mr. Wood one of the ones that had some of those tracts?

A. Yes, sir, he has some small tracts that have wells on them, other than the one he claims offsetting my lease.

Q. Mr. Rowan, what did you find over there with reference to density—just pick out certain cases, offhand. Did you find where there were as many as five wells to one acre or anything like that?

A. Yes, sir, I think there are leases over there in the various townsites that have that situation. The worst situation, of course, is at London, London Townsite.

Q. What is the average density there?

A. I made a computation of various tracts, and there is 154 wells on 51 acres. There is some tracts in there as small as half an acre with five wells on it.

Q. Do you mean the average density is three wells to one acre?

A. That is correct.

Q. What affect does that have, if any, on the other operators who like you are not so densely drilled?

A. It has the effect, I think, of taking somebody else's oil, in these densely drilled areas.

Q. All right, Mr. Rowan, do you know of any reason why in order to prevent waste it was necessary to drill more than one well on these one to five acre tracts in order to get the oil out from under those tracts, do you know of any reason?

Mr. Hart:

If the Court please, we wish to object to that. There are special facts arising in each case, and in
42 each case the Railroad Commission takes into consideration those facts. I submit he can't know that, and I think it is improper for him to testify to it.

The Court:

He is qualified as an expert on it. He can testify to it for whatever it is worth.

Q. Mr. Rowan, do you know of any reason to prevent waste why they should drill more than one well on those tracts, those one to five acres?

A. No, sir, I do not.

Q. You say you have a tabulation here showing those areas?

A. Yes, sir.

Mr. Tilley:

And I want at this time to offer that.

Mr. Hart:

As of what date was that compiled, Mr. Tilley?

The Witness:

January 1st.

Mr. Hart:

May I see it?

Mr. Tilley:

I would like to offer in evidence the tabulation he testified about a while ago, which showed the number of barrels in place, and so on.

The Court:

Which is correct? On this one someone has corrected it with pencil.

Mr. Moody:

That is a note, your Honor, for another matter.

The Court:

This one has a question mark by it.

Mr. Tilley:

That is because there was a mistake of one per cent.

Q. Isn't that right, Mr. Rowan?

A. That should have been ninety-five. When
43 the stenographer wrote that I had it ninety-five,
and I had a little asterisk, and she took it for
95.1.

(The above referred to documents were thereupon received in evidence, the same being marked Exhibits 1 & 2.)

Mr. Hart:

If the Court please, we wish to object to this offer of the schedule showing the density of drilling in certain isolated areas because there is no proof of the distance between those areas and complainant's lease, and there is no proof that he is being drained by any of the wells on these particular tracts, and for those reasons we object.

The Court:

I think it is going to regulation generally, isn't it?

Mr. Hart:

This complainant has to show he has been hurt.

The Court:

Yes; still, the general plan as to the reasonableness or unreasonableness of it is there.

Mr. Tilley:

In that connection, first, he testified this would effect him, it was draining his oil.

(The above referred to document was thereupon received in evidence, the same being marked Exhibit 3.)

Q. Now, Mr. Rowan, how are leases and royalties bought and sold in the East Texas field?

A. By the acre.

Q. How are they bought generally throughout Texas?

A. By the acre.

Q. You mean acre what, now?

44 A. Leases and royalties are usually bought by the acre, Mr. Tilley.

Q. In speaking of values, though, where you have a proven lease, what do you consider in the purchase of a lease?

A. We consider the underground reserves.

Q. When you bought this lease on what basis did you buy it?

A. I bought it on an acre basis, but I give consideration to the underground reserves on the basis of having paid a higher price for it. I wouldn't have paid that high price if I hadn't thought it had a higher content.

Mr. Hart:

We ~~object to that as being irrelevant and immaterial~~ to the issues involved in this case.

The Court:

I think that is going a long way afield.

Mr. Tilley:

If the Court please, they have ~~admitted that, but the~~ statute is that ~~the order must be reasonable.~~ Now, if the Court please, if we can show—

The Court:

I know, but that isn't shown by what he had in mind when he bought his lease.

Mr. Tilley:

We tried to show, your Honor, that leases over there now are bought and sold on an acreage basis, and the State is taxing them on an acreage basis. Now, if the State on the one hand taxes them on that basis and then in a proration plan doesn't give effect to that I think that shows the plan is arbitrary.

The Court:

The tax question is another thing. I think we all know
 45 that we can't hold the State to anything on account of taxes. I think the evidence is immaterial.

Mr. Tilley:

The Court will let us have our bill?

The Court:

If you want it for the purpose of the record you can put it in, but I wouldn't give it any consideration. If you want to put it in the record—

Mr. Tilley:

I would like for the record to show, if it is agreeable with the Attorney General, that if the witness was permitted to testify, that at the time he bought this lease in the East Texas field leases were bought and sold on a basis of the amount of oil under the tract, and that they are now taxed on all accounts on the same basis.

Mr. Hart:

I don't know what he would testify to. I wouldn't agree that those are exactly the facts.

Q. Will you testify to that?

A. Yes, sir.

Q. Will you further testify to the fact that they also consider acre sand feet?

A. Yes, sir.

Mr. Moody:

I would like to inquire of the Court. I don't understand the Court's ruling. Values are calculated on oil reserves and oil reserves are determined by acre feet of sand underneath the surface area of a lease. Does the Court hold that that—that testimony to that effect would be immaterial where the contention is, as in this case, that this order operates to deprive the plaintiff of its property without due process of law.

The Court:

I think so. You might go out and buy an oil lease on the assumption that you would get a lot of oil
46 from the land and then regulation might come along and prevent you from doing it. It doesn't make any difference why you did it.

Mr. Moody:

I am getting away from how this man or any other individual might have bought it, but the method of determining value, the value of the oil properties is the thing.

The Court:

You have it in the record, haven't you?

Mr. Moody:

Yes, sir.

The Court:

If it is worth anything. Personally, I wouldn't give any consideration to it in the matter of passing on the validity of the order, but some other Court might.

Q. Mr. Rowan, what does the Railroad Commission call a submarginal well?

A. They list in the front of your proration schedule a list of wells they call submarginal wells, which are wells that won't make twenty barrels of oil per day.

Q. Now, how many of those wells are there?

A. 463 of them.

The Court:

How many?

The Witness:

463.

Q. Now, Mr. Rowan, do you have the—

The Court:

Do they allow them to make twenty barrels as an arbitrary figure?

47 The Witness:

No, sir; they allow those wells to make just what they will make. None of those wells will make twenty barrels. They are all wells that make less than twenty barrels.

Q. Mr. Rowan, do you have a tabulation showing the number of wells which are permitted to produce under a present proration schedule of from twenty to twenty-one barrels per day?

A. Yes, sir.

Q. How many such wells are there?

A. There is 21,179 wells in the field that produce twenty barrels, but less than twenty-one.

Q. All right, how many from twenty-one to twenty-two?

A. Two thousand.

Q. From twenty-two to twenty-three?

A. 1,831 wells.

Q. And twenty-three to twenty-four, and so on?

A. Twenty-three to twenty-four there is 319 wells; twenty-four to twenty-five there is 96; there is twenty-two wells that will produce over twenty-five barrels in the field.

Q. Then, as between the poorest well in the field, except submarginal wells, and the best well in the field there is only a five barrel differential in allowable?

A. Yes.

Q. Now, how many of those wells get as much as twenty-five and under twenty-six?

A. Twenty-two.

Q. A very small percentage?

A. Yes, sir, very small percentage of the total.

48 Q. Then, from your interpretation of that schedule, Mr. Rowan, state whether or not that field over there in East Texas, the East Texas field, if you know, is on a practically per well basis?

A. It is practically per well, yes, sir.

Q. If you don't—Mr. Rowan, you stated a while ago what the total daily allowable for the field is over there. Now, taking into consideration the allowable of twenty barrels to twenty-one barrels, how many wells are there there?

A. 21,179.

Q. A total of 25,900 wells?

A. Yes, sir.

Q. Less 375 submarginal wells?

A. Less 463 submarginal wells.

Q. Now, how much daily allowable for distribution between those wells which are given an allowable of twenty-two or more barrels?

A. Well, if you deduct the submarginal wells, which won't make twenty barrels, you have 25,440 wells, and if you allow those wells a flat allowance of twenty barrels minimum you have a total of 508,000 daily allowable, which leaves you from the top allowable—from the present allowable, I should say, about 14,000 barrels.

Q. About 14,000 barrels?

A. Of allowable that is distributed.

Q. On a potential basis?

A. On a potential basis, yes, sir.

Q. Now, tell the Court just how many wells are in the field, then, again on a per well basis and how many on a potential basis, and I think you have already, of course, stated very clearly what the amount of allowable is to be apportioned?

A. There is about 14,000 barrels to be apportioned, and there is about twenty thousand wells in the field that are on a per well basis, a flat twenty barrels per well.

Q. And a margin of five barrels between the worst well in the field, that is that will produce—not the worst, but one that will produce as much as twenty barrels and no more, and a well such as yours that will make twenty thousand barrels a day?

A. Yes, sir.

Q. What is the top field allowable?

A. For any well?

Q. No; of the whole field?

A. 522,000 barrels.

Q. Do you have the percentage there of the allowable that is allocated on a potential basis?

A. The percentage? It is 14,000 barrels. It is less than—

Q. About three per cent?

A. Right at three per cent, yes, sir.

Q. And the balance of it, of course, is on a per well basis?

A. Yes, sir.

Mr. Tilley:

We want to offer at this time the record that was made before the Railroad Commission at the time that he applied for the adjustment in allowable.

Q. In this connection I would like to ask you, Mr. Rowan, did you also make this same application before the three members or before the Railroad Commission at its regular monthly hearing?

A. Yes, sir, twice.

Q. You testified twice at those hearings or offered to testify twice, or both?

A. I testified once, and the other time I offered a written application.

The Court:

On what theory do you think that is admissible?

Mr. Tilley:

What theory, your Honor?

The Court:

On what theory do you think that record of the hearing before the Commission is admissible?

Mr. Tilley:

To show that we have exerted every effort we possibly could.

The Court:

The fact that you went before them would be admissible, but the record itself certainly would not be admissible unless there was some question raised as to whether the hearing was in compliance with law. It is just burdening the record with a lot of matter which nobody will read.

Mr. Hart:

We have raised the point they didn't offer such evidence before the Commission to justify the Commission to change the plan.

The Court:

I know; but this Court examines that de novo, doesn't it? This Court is not bound one way or another by that. Of course, there are some decisions that hold if the Commission didn't really have a bona fide hearing that the order is invalid, but I don't understand that there is
 51 such a question as that raised here. That has come up before us a great number of times in these three judge cases. They were never appealed or taken up, but we have always held we were not bound by the evidence produced before a Commission.

Mr. Hart:

If they fail to offer any evidence at all to sustain their application before the Commission we can show that. They have to come before the Commission and show some

evidence to justify the Commission in changing the order or offering some plan that is sufficiently definite that the Commission can act on it, and our contention is that they haven't done that, and for that reason we will have no objection to the offer of the testimony before the Commission.

The Court:

If they want to put it in, I am not going to sit here and listen to you read it. It is easy to burden these records down with a lot of matters, but it is a different story when you come to write it up.

Mr. Tilley:

If the Court please, we don't think we have to go to the Railroad Commission if this is a void order, but we do want to offer it out of an abundance of precaution.

The Court:

I will let it come in evidence if you want to put it in.

(The above referred to record was thereupon received in evidence, the same being marked Exhibit 4.)

Q. Mr. Rowan, do you have royalty owners who own royalty under that tract there?

A. Yes, sir.

52 Q. Do they know of the condition which exists with reference to the Wood tract?

A. Yes, sir.

Q. Do you know whether or not suits are being instituted against these owners in the East Texas field by virtue of the condition which exists over there on your lease?

A. Yes, sir.

Q. Do you have reason to believe such a suit might be instituted against you?

A. Yes, sir.

Cross Examination.

Questions by Mr. Hart:

Q. Mr. Rowan, I would like to get, if I can, first of all just what your position is with reference to the proration orders of the Railroad Commission. Do you have any objection to the proration order on the basis of the total allowable for the field?

A. For the field?

Q. Yes, sir?

A. No, sir, I do not. I think that it ought to be on a daily basis, and I think it ought to be spread over seven days a week. I don't think it is particularly good for the field to produce five days a week and to shut it down two days a week. I think the movement of water ought to come into the reservoir every twenty-four hours.

Q. In other words, you believe that the present method of proration, insofar as it fixes the top allowable at about the amount it is now fixed, is a good measure?

53 A. Yes, sir, I think it is all right.

Q. And you think so for the reason that by restricting the amount of oil which is taken from the whole field the energy, the water energy, is conserved, is that correct?

A. That is correct.

Q. The East Texas field is what is called a water drive field, is it not?

A. Yes, sir.

Q. The water drive comes from the west, is that correct?

A. That is correct.

Q. And is that water level at the present time approximately horizontal, if you consider the field as a whole?

A. I would say approximately horizontal. I wouldn't say it was definitely horizontal.

Q. Do you mean it varies from place to place over the field or that it may be at some angle from horizontal?

A. It is at some angle at certain places.

Q. In other places it is substantially horizontal, is that right?

A. Yes, sir.

Q. Now, you believe, then, that the proration order limiting the amount of the allowable of the field as a whole conserves energy?

A. Yes, sir.

Q. And thereby leads to a total greater recovery of oil from the field as a whole, is that correct?

A. Yes, sir, if that allowable is properly proportioned.

Q. I am talking about the total allowable. You don't have any quarrel with that, do you?

54 A. I don't think you can take a total allowable and say you can apportion that in any way and still prevent physical waste. I don't have any quarrel with the total allowable.

Q. Do you think by restricting the output of the field to approximately the figure the Commission has adopted by the present order you are conserving, and thereby increasing, the total yield from the field as a whole?

A. Yes, sir, I do.

Q. You do?

A. Yes, sir.

Q. Then, under this system, under a proration system, disregarding for the time being the question of allocation between tracts, but under a proration system there is a greater total greater recovery of oil from the field than there would be if there was no proration?

A. I think that is correct.

Q. You think that is correct?

A. I believe that is, yes, sir.

Q. Now, your quarrel, then, is with the method of allocation between the tracts?

A. That is correct.

Q. You claim, I believe, that you ought to be able to get 235 barrels a day, is that right?

A. About 222 at this time. About 220 barrels at this time, a day.

Q. Why has your figure changed from the time you filed your petition?

A. We recalculated our reserves and reduced them slightly.

Q. Didn't you get them right the first time?

A. We recalculated them and reduced them just slightly.

Q. Just tell me what new calculations you had to make in order to reduce them?

A. Reduced the sand thickness from one hundred feet to ninety feet.

Q. What caused you to reduce your figure on sand thickness that much between the time you filed your petition and this trial?

A. By the study of information that was available in the field.

Q. What information are you talking about?

A. Well, logs and Schlumberger logs.

Q. On what well?

A. Particularly Schlumberger logs on wells in the field close to us.

Q. Do you have a list of the wells you considered in determining that figure?

A. Yes, sir.

Q. Do you have it available?

A. No, sir, I don't have it with me. We have it on a map. It is going to be presented by the engineer.

Q. Do you have that available at this time?

A. I don't have it with me, no, sir.

Q. Will you have it so I can ask you about it after lunch?

A. Yes, sir.

Q. Now, you say that your allowable, your figure, your total allowable for your lease under your plan of proration ought to be about 220 barrels, is that what you said?

A. 220 a day, yes, sir.

56 Q. Now, would you prorate the total allowable of the field strictly on your basis or would you fix some kind of minimum allowable?

A. I might fix a minimum allowable for tracts. I don't think I would fix a minimum allowable to a well. If a man had a tenth of an acre and drilled three wells, I wouldn't give him a minimum for each well, no, sir.

Q. Tell the Court what minimums you would allow?

A. For each tract?

Q. Yes, sir?

A. I think five barrels for each tract per day.

Q. What size tract?

A. Any tract less than ten acres.

Q. You would allow to any tract less than ten acres only five barrels a day?

A. That is correct.

Q. Is that right?

A. That is my minimum, now, that is a minimum. In other words, you couldn't go below five barrels per day, that is right.

Q. Per ten acre tract?

A. That would be an arbitrary figure.

Q. You would just be giving it to him out of the graciousness of your heart. Do you put that on the basis of a seven day producing week or five day?

A. Seven.

Q. On the basis of a seven day week?

A. Yes, sir.

57 Q. Now, would you entirely disregard the number of wells that a man may have drilled on a ten acre tract under valid orders of the Railroad Commission?

A. Yes, sir.

Q. If a man, say, had drilled as many as three or four wells on that ten acre tract, you wouldn't allow him any more than if he had drilled only one well?

A. No, sir.

Q. In other words, you think that the investment that he has put in the wells that he may have drilled on that tract in ~~excess of the number that would drill it up to one~~ well to ten acres should be entirely disregarded by the Railroad Commission at the present time, in spite of the fact that this potential method of allocation has been in effect now for about five years?

A. Yes, sir, I think you ought to disregard it.

Q. You think that the Commission ought to enter an order, then, which will practically deprive him of his investment there?

A. I didn't say that. He can keep his investment there, but I don't think that the Railroad Commission ought to put an allowable on those wells whereby he can make a profit on them or guarantee him to get that investment back.

Q. You understand that the present method of pro-rata has been in effect since April, 1933, has it not?

A. I believe that is about right.

Q. Your suit in Fort Worth was tried before a three judge Federal Court in June of 1933, was it not?

A. I think that is the date.

Q. May 25th, 1933?

58 A. Yes, sir, that is about right.

Q. The Houston case you are talking about was tried prior to that time?

A. Yes, sir; I think in January.

Q. And that was the case where the Commission took into consideration purely the per well method of allocation, was it not?

A. No, I don't think so. I think the allowable at that time was based ninety percent on per well and ten percent on bottom hole pressure. There was some slight correcting factor.

Q. You spoke of filing some suits. Have you filed any suit between the suit tried in Fort Worth in May of 1933 and the suit which you filed in this case in September of last year, I believe?

A. I believe we have, yes, sir.

Q. What other suit was that?

A. I believe we have made an application for additional permits, and didn't get them, and we filed a suit in Judge Wilson's Court.

Q. When was that?

A. I don't remember just exactly the date.

Q. Do you know the number of the case or the style of it?

A. It would be Rowan & Nichols versus Railroad Commission.

Q. What was the outcome of that case?

A. It was set for trial at 10:00 o'clock on Monday morning, and about 9:00 o'clock the Railroad Commission or the Attorney General's office phoned and said the permits had been granted, and we withdrew the
59. suit.

Q. What permits was that?

A. I think permits for Wells No. 3 and 4.

Q. Those were granted on July 5th, 1933, were they not?

A. I don't remember that.

Q. Look up your figures there.

A. Maybe I have it. Wells No. 3 and 4. I don't have the date that the permits were granted, but Well No. 3 was commenced, and I assume that the permit was granted prior to that time, on July 12th, 1933; and Well No. 4 on September 3rd, 1933.

Q. Well, don't you know, as a matter of fact, and haven't you previously testified that those permits were granted on July 5th, 1933?

A. I don't remember. They could possibly have been. They were granted prior to the time we commenced these wells, I will say that.

Q. All right. Now, was that suit you filed in Judge Wilson's an appeal from the order of the Railroad Commission refusing to grant a permit or an attack on the proration system?

A. No, sir; it was an appeal from the Commission refusing to grant us a permit.

Mr. Tilley:

I object to that, if the Court please, because the petition would be the best evidence; and I ask that that answer be stricken.

Mr. Moody:

He is an expert on oil, not law.

The Court:

Sustain the objection.

Q. Do you have a copy of that petition with you, Mr. Pawan?

A. No, sir, I don't.

Q. Could you get us a copy?

60 A. Mr. Tilley might have it. I don't know whether he has it or not.

Mr. Tilley:

I haven't it.

Mr. Hart:

If the Court please, I submit he ought to be able to testify what relief he was seeking in Court. We haven't made technical objections to these matters before.

The Court:

It is a matter between counsel, if they are agreeable to do it, but the objection is good.

Mr. Tilley:

Judge, if that wasn't five or six years ago I would agree to it.

The Court:

I don't see very much materiality in it one way or the other.

Mr. Tilley:

We will show him a copy of every petition we have, and I think we have every one, during the noon hour. We will let you have them.

Q. During that time and the time you filed this suit have you filed any suits of any kind attacking the pro-ration orders of the Railroad Commission, between those times?

A. No, sir. You are speaking of the one I tried in Fort Worth?

Q. All right.

A. No, sir, we haven't.

Q. At the time you filed this suit in Fort Worth there were approximately 10,000 wells drilled in the East Texas field, were there not?

A. I think about 9,000.

Q. You think about 9,000?

A. Yes, sir, I think that is about right.

61 Q. And since that time there has been drilled something over 16,000 wells in the East Texas field, has there not?

A. That is about right, yes, sir.

Q. Those wells, of course, have to be drilled under orders from the Railroad Commission, do they not?

A. Yes, sir.

Q. Either to prevent confiscation of the property or to prevent waste?

A. Yes, sir.

Q. And any person aggrieved by any of those orders can go into Court and attack the validity of those permits, can they not?

A. Yes, sir, I guess so.

Q. Now, your position is that the Railroad Commission should enter an order which would make it impossible for a man who has drilled his lease to a density of more than one well to ten acres to recover any profit or return on his investment, is that correct?

A. If in doing that they are going to take my property away from me and give it to him so he can make a profit, I do object to it.

Q. You take the position that the Railroad Commission should not consider the fact of this scheme of proration being in effect for something over five years, or take into consideration the number of wells that have been drilled while that order was in effect?

A. I take the position that they shouldn't consider that.

Q. You take the position that they shouldn't consider that, and if you are getting somewhat less oil
62 than you think you ought to get they should change the order?

A. Yes, sir. During those five years I haven't set idly and not protested.

Q. Have you filed any application for a change in allowable with the Commission except the one you filed prior to this suit, in February, 1938?

A. Yes, sir; I have been down there in person.

Q. Do you have a copy of any applications?

A. No applications in writing, but I have been before the Commission in person and asked them to change the method of allocation.

Q. Do you have any of the records showing any of the hearings at which you appeared or what you testified at those hearings?

A. No, sir, I don't have them.

Q. Could you give us the dates of any of the hearings at which you appeared?

A. No, sir, I cannot.

Q. Did you ever at any of those hearings offer expert testimony?

A. No, sir, none except my own, and I wouldn't consider that very expert.

Q. You don't claim to be an expert, do you, Mr. Rowan?

A. I don't claim to be a petroleum engineer or a geologist. I think I have a lot of experience in drilling and producing oil. I think I know the fundamental principles of geology. I think I could look at it as just a matter of engineering, I could look at a contour map and tell what it was all about.

Q. Would a contour map mean anything to
63 you?

A. Yes, sir, it would mean something to me.

Q. Would a potential contour map mean anything to you?

A. I could read it.

Q. Would it give you any information with reference to the potentials of the wells within the contour lines?

A. If made accurately, yes, sir.

Q. In other words, a contour map is an accepted method of determining points which have not been individually tested, isn't that true?

A. That is correct, but it is subject to error.

Q. Any method is subject to error?

A. Yes, sir.

Q. You yourself made an error, I believe, of the number of barrels you were entitled to under your scheme?

A. Yes, sir.

Q. Any method you adopt, therefore, is subject to a certain amount of error?

A. That is correct, yes, sir.

Q. Now, let me go further into your plan. I believe under your plan of proration you would allow a man who had, say, three wells on a ten acre tract to produce all of his allowable on one of those wells on that ten acre tract?

A. If it was situated in the middle of his tract I would, yes, sir.

Q. In other words, you would allow him to just plug in those two wells and produce all of his oil from only one of those wells?

A. He could plug them in or shut them in; 64 it wouldn't hurt.

Q. Your position, then, Mr. Rowan, is one well on a ten acre tract can bring in all the recoverable oil on that tract?

A. I think it can, sir.

Q. Has that always been your position, Mr. Rowan?

A. Yes, I would say so under proration, I think so, yes, sir.

Q. Haven't you applied for exceptions to the rule, exceptions to Rule 37 in drilling your Todd B Lease on the ground that by drilling four wells, rather than one well, to ten acres you would recover oil which otherwise would not be recovered?

A. I don't think so.

Q. When you drilled wells Nos. 1 and 2 on your tract what density did that give you on your tract?

A. A well to every twelve and one-half acres.

Q. All right, when you applied for wells 3 and 4, assume those wells were granted, what would your average density be on that tract?

A. It would be a well to six and a quarter acres.

Q. A well for how many?

A. Six and a quarter acres, just about six and a quarter acres.

Q. In other words, that would give you a density of more than one well to ten acres, wouldn't it?

A. Yes, sir.

Q. Mr. Tilley was representing you, was he not, at the time you applied for wells 3 and 4 on your B Todd Lease?

A. Yes, sir.

Q. The B Todd Lease?

A. Yes, sir.

Q. I show you here the brief or statement
65 or arguments filed by Mr. Tilley in support of your application for wells 3 and 4 on your Todd B Lease filed with the Commission on October 11th, 1932, and I will ask you if that application doesn't contain this statement, "however, this applicant submits that the drilling of these additional wells applied for herein would in no way cause or create physical waste and that the ultimate recovery from said acreage would be greater if these permits were granted and these additional wells drilled, and therefore waste avoided by the recovery of this oil which would not otherwise be brought to the surface." I will ask you if that was not your contention at the time you applied to the Railroad Commission for wells 3 and 4 on your twenty-five acre lease?

A. I think I had enough wells on it at the time that I could have taken the oil out of it and not created physical waste.

Q. Well, didn't you take the position at that time that by getting these additional wells on your acreage, reducing your density from one well to about twelve acres to about one well to about six acres you would get a greater recovery of oil under your lease and thereby prevent waste?

A. I might have taken that position, but that is not my position now.

Q. That was your position when you were getting more wells in 1933, but it is not your position now?

A. No, I wouldn't say that.

Q. Well, what do you say?

A. I wouldn't say that I would say at that particular time—I felt that drainage was taking place from that lease, that is what I say.

Q. All right, let's see about that. Was your well at the time you applied—was your tract at the time you applied for wells 3 and 4 more or less densely drilled than surrounding tracts?

A. I believe at that time it was about the same density as the surrounding tracts.

Q. Well, let's just take up your lease then by the number of wells that you drilled. You got your first permits on October 10th, 1931, for wells 1 and 2 on your tract, did you not?

A. That is correct, just about that time.

Q. Now, both of those wells were granted as exceptions to Rule 37, were they not?

Yes, sir.

Q. If the Railroad Commission had enforced Rule 37 and refused to allow you to drill any wells that were within that rule you wouldn't have gotten any wells on your tract, would you?

A. That is correct.

Q. But to prevent waste they gave you two exceptions to start out with, didn't they?

A. Yes, sir.

Q. Now, at that time there weren't any wells drilled in most of the surrounding tracts around the Todd B Lease, were there?

A. In 1931?

Q. Yes, sir.

A. No, I don't think there was. I don't think there were many wells drilled in that particular area. I think we were one of the first to come in there.

Q. In other words, there were no wells then on the Sun-Allen Tooke A Lease, no wells on the Shell-Bassett Lease, no wells on the Amerada-Bumpus?

A. There was one location on the Arkansas Fuel. I believe the Arkansas Fuel had a well on their tract on their Houston-Stephens.

Q. There was one regular location on the Continental Oil Company's lease, was there not, Continental-Todd?

A. Our recollection is we drilled our well before the Continental, that is, the 1-A. I might be wrong about that.

Q. There were no wells on the Turner tract up here, were there?

A. No, sir; I don't think there were any wells north of that.

Q. No wells on the Magnolia tract?

A. No, sir.

Q. No wells on the Magnolia-Foster tract?

A. No, sir, I don't think so.

Q. No well on the Atlantic-Tooke B tract?

A. There might have been. That was a little ways away from our tract, and I don't remember whether there was or not, at that particular time drilling was pretty sparse in 1931, there hadn't been much drilling in that particular area.

Q. Now, when you were granted these exceptions by the Railroad Commission you were thereby granted a density of considerably more than the surrounding tracts, were you not?

A. No, sir; that is the situation, but actually
68 I drilled those wells under orders of the Railroad Commission, the order of the Railroad Commission that granted one well to twenty acres. They put it on a basis of one well to a twenty acre unit, they said each person could drill a well on each twenty acres or a fraction.

Q. Your wells were drilled as exceptions to Rule 37?

A. Yes, sir, Todd B. That is on account of the narrowness of the strip of land.

Q. But they were granted as exceptions to Rule 37?

A. Yes, sir.

Q. And at that time the surrounding area around your tract was not drilled to anywhere near the density of your tract, was it?

A. I would say it wasn't. I don't know for sure.

Q. Now, in 1933 when you got wells 3 and 4 was your tract drilled to anywhere near the density of the surrounding tracts?

A. I think it was about the same.

Q. Well, now, let's see about that. On the Sun-Allen Tooke A Lease at the time that you applied for wells 3 and 4, which would give you a well to about six acres—

A. Now, just a minute. I don't understand your question. I understood you to say at the time I applied for that I had a well to twelve and a half acres then, and I think that was about the density of the surrounding territory. After I drilled those I think I was drilled up to a little bit bigger density after drilling those wells. I might not have understood your questions.

Q. In other words, after you drilled wells 3 and 4 you were drilled more densely than any of the surrounding tracts?

A. I think so, yes, sir.

69 Q. Do you know how many wells there are in the Sun-Allen Tooke A Lease?

A. I believe there is fifty-seven. I would have to look at a map to be sure. I believe it is fifty-seven.

Q. Well, there were three wells on there at the time you applied for your three and four. What would that make their density?

A. That would make a density of about eighteen, about nineteen. I guess between eighteen and nineteen.

Q. You had a density then of one well to twelve and you were trying to get a density of one well to six?

A. If that is correct, yes, sir.

Mr. Tilley:

We want to interpose this objection. We don't mind the—first, they are trying to impeach their own orders. They granted these permits. And second, the test as to whether or not these wells were wisely drilled is whether or not he would be entitled to get the oil which is estimated to have underlain his leases, and not as to how many wells there were on one tract or another tract at that time.

The Court:

What is the materiality of that?

Mr. Hart:

The materiality of it is this, if the Court please, they complain of the present orders of the Railroad Commission on the ground that a man is forced to drill additional wells in order to recover the oil that is under his land. He has complained specifically of the drilling in isolated areas throughout the whole field, and in some of the surrounding tracts. Now, I will say that our position is that he is not in position to complain about that because he has taken advantage of the fact that the Commission would grant exceptions to Rule 37, and has taken the initiative in dense drilling, and he himself has caused the dense drilling around his tract, and he is not in a position therefore to complain of it. That is, I understand, one of their complaints, the dense drilling of the surrounding tracts, and we wish to show he has initiated the dense drilling in this area.

Mr. Tilley:

If the Court please, we take the position that he is not relegated to ask for an adjustment in allowable if he can get enough permits to produce the oil underlying his tracts. That is all he has ever done. Unless they can show he is trying to get more oil than he was entitled to eventually or had created a waste condition I don't think it is admissible.

The Court:

Overrule the objection.

Q. All right, sir, let's take the Shell-Bassett Lease. Do you know how many acres there are in that lease?

A. No, sir, I don't.

Q. About fifty-four acres, aren't there?

A. That is about right, yes, sir.

Q. That lease at the time you applied for wells 3 and 4 had four wells on it. What would that density be there then?

A. 3 and 4?

Q. Yes, sir.

A. Had four wells on it, did you say?

Q. Four altogether, 1, 2, 3 and 4.

A. That would be approximately one well to
71 twenty acres, eighteen acres. You say fifty-seven acres?

Q. Fifty-four acres?

A. Fifty-four. No, it would be about one well to about thirteen acres.

Q. About thirteen acres. That wasn't quite as densely drilled as your acreage?

A. No. Mine was a twelve and a half.

Q. Do you know how many acres there are in the Amerada-Bumpus Lease?

A. I believe there is over a hundred acres in that lease.

Q. That lease had six wells on it at the time you applied for wells 3 and 4. What would be the approximate density of drilling on that lease then?

A. Well, assuming also that it is a hundred acres, that would be six into a hundred. I will make the calculation for you. I am pretty slow in arithmetic.

Q. That would be something over one well to sixteen acres?

A. That is right.

Q. They were also less densely drilled than your lease?

A. Yes, sir.

Q. Let's take the Arkansas Fuel Company-Houston-Stephens Lease there. That is a fifty-seven acre lease. It shows here on this map they had at that time three wells. What would that make their density?

A. Fifty-seven acres and three wells?

Q. Yes.

A. That would be about seventeen acres, I believe, between seventeen and eighteen acres.

Q. About seventeen acres?

A. Yes, sir.

Q. Now, the Continental. They have a forty acre lease on the W. T. Todd, don't they?

A. Yes, sir.

Q. They at that time, I believe, had four wells, and that would make one well to ten acres?

A. Yes, sir.

Q. That is the lease that was a little more densely drilled than yours?

A. Yes, sir.

Q. All right. Now, the Magnolia at that time, the Magnolia-H. L. Foster, they had two wells drilled on their twenty-nine acre lease. What would their density be at that time?

A. Twenty-nine and two wells, that would be fourteen and a half acres.

Q. They were not as densely drilled as you were, were they?

A. Yes, sir, they were. No. No, they were not as densely drilled as I was.

Q. Then take the Atlantic-H. L. Foster Lease. They had two wells at that time, wells 1 and 2, and a thirty-one acre tract. What was the density of drilling on their tract at that time?

A. Two wells on thirty-one acres would be fifteen and a half acres to a well.

Q. Well, then, except for the Continental tract, which was only slightly more densely drilled than your tract, all of the surrounding tracts were much less
73 densely drilled than your tract, all of the surrounding tracts, were they not?

A. That is correct, if the information you have read off to me is right. I don't remember, but I think you are substantially right about it.

Q. You don't have any doubt about it in your own mind at this time, do you?

A. No, I don't question it.

Q. You can check that up by the map; if I have made an error in that I would be glad to have you correct your testimony.

A. Yes, sir, I think that is right.

Q. Do you know how many wells were drilled as offsets to your four wells, direct offsets granted by the Commission because of your drilling to a greater density than one well to ten acres? How many offsets were caused on surrounding leases by your drilling?

A. On my four wells?

Q. Yes, sir.

A. I expect a good many, because that was in the early life of the field, and I expect there were a good many wells drilled in there right after that.

Q. Well, do you know how many there were?

A. I have no idea.

Q. You can't give us any idea of how many wells had to be granted as exceptions to Rule 37 because you got exceptions to Rule 37?

A. No, I don't.

Q. Well, would it be as many as twenty, or more than that?

A. Possibly.

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Q. Possibly more than twenty?

A. Possibly twenty, yes, sir.

(At this time a recess was taken until 2:00 o'clock p. m., the same date, at which time the following proceedings were had:)

Q. Now, Mr. Rowan, at the time recess was taken this morning I believe we had about arrived at the point where we had gone around your Todd B Lease on July 5th, 1933, and shown that except for the Continental tract there weren't any of the tracts at that time drilled to as great a density as your tract?

A. That is correct.

Q. Then you drilled your wells three and four shortly after that, didn't you?

A. Yes, sir.

Q. That gave you a great deal greater density than the surrounding tracts, didn't it?

A. Yes, sir.

Q. And a much greater density than the average throughout the field at that time?

A. I don't know about that, but that statement is possibly true.

Q. Well, the general density in the field today is about one well to five acres?

A. That is right.

Q. And those wells were drilled back in 1933?

A. Yes, sir.

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Q. And during that time there have been about 16,000 wells drilled?

A. That is correct.

Q. We would be safe in saying your wells were drilled to a much greater density than the field?

A. The limits of the field have been extended and more acreage taken in. At that time we were computing the field at possibly 110,000 acres, and I think there have been some extensions along the east side, and maybe up to the north, but not a whole lot.

Q. Well, you really change your ideas about the extent of the field and other factors of that kind whenever a well is drilled, don't you?

A. You do if it extends the limits.

Q. Each new well gives you new information about sand thickness and permeability and the character of sand, that goes to determine what the whole reserve of the field are?

A. I don't think so.

Q. You don't think a new well gives you any additional information?

A. It gives you some additional information, possibly, as to the extent of the sand right under that particular well.

Q. You don't think it helps you in determining the recoverable oil in the field as a whole?

A. In determining recoverable oil?

Q. Yes.

A. No, I wouldn't say so.

Q. All right, sir. Now, when was your Rowan & Nichols Well No. 5 drilled?

A. It was drilled in 1934.

76 Q. It was granted on May 2nd, of 1934, was it not?

A. I believe that is about right, yes, sir.

Q. And it was drilled, completed June 1st of 1934?

A. That is about right, yes, sir.

Q. Now, the drilling of that well was a result of these circumstances, was it not, on July 5th, 1933, when your well No. 3 was granted as an exception to Rule 37; then, as a direct and equal distance offset to that well No. 3 on your Todd B tract Sun Oil Company-Allen Tooke No. 5 was granted by the Commission as a direct offset to your well, is that right?

A. I believe so.

Q. And then as a direct and equal distance offset to Sun Oil Company-Allen Tooke No. 5, the Shell Oil Company-Bassett No. 6 was granted south of your tract, is that right?

A. Yes.

Q. And then you were granted No. 5, a direct and equal distance offset to Shell-Bassett No. 6 on May 2nd, 1934, is that correct? In other words, there was just a complete circle of exceptions to Rule 37 granted there starting with your well No. 3 and running around to your well No. 5?

A. I think that is probably correct. We drilled four wells in 1934, one on that lease and three up in A Lease.

Q. Just talk about this lease. This is the only one under consideration?

A. That is right.

Q. In other words, by drilling your No. 3 as an exception to Rule 37 you started those offsets which resulted in your drilling No. 5?

A. I don't know about that. I don't know that they drilled that because I drilled that well or not. They may have, and they may have had other motives.

Q. Don't you know the Commission granted it on that ground?

A. To the Sun?

Q. Yes, sir?

A. Maybe.

Q. Yes, sir?

A. I don't know; I expect they did.

Q. You don't have any doubt about those facts, do you? I can show you the record if you want it.

A. I expect that is the reason they granted it, but I don't know whether the Sun offset that well or not.

Q. Now, in 1934, then, you had five wells drilled on your lease?

A. That is correct.

Q. And at that time your lease was drilled to a greater density than the surrounding tracts, wasn't it?

A. That is correct.

Q. And it was drilled to a greater density than the average of the field as a whole?

A. That is correct.

Q. Now, at the present time if you take into consideration the average density of the surrounding tracts around your lease, or the average density of the field as a whole, you are drilled to approximately the same density as those tracts or as the field as a whole?

A. That is correct.

Q. And the field is just now catching up with you, isn't it?

A. That is correct.

Q. And now that the field has approximately caught up with you you want the allowable changed?

A. Yes, sir. That is not my reason, but I want it changed.

Q. All right. Now, you have not only drilled five wells, but you have received a permit to drill a sixth well?

A. That is right.

Q. Mr. Tilley asked you something about a rehearing on that application. The Commission granted you well No. 6, and the rehearing was on their refusal to grant you wells 7 through 25, was it not?

A. Yes, sir, that is correct.

Q. That is correct?

A. Yes, sir.

Q. So you still have a permit granted by the Commission to drill a sixth well on your tract?

A. That is correct, Mr. Hart, but the Commission says that that permit, that that well should be located in such a manner that we couldn't locate it.

Q. It was a direct and equal distance offset to the R. M. Wood well, was it not?

A. That is correct, but we don't know where that line is.

Q. Well, the Commission had given you a direct and equal distance offset, hadn't it?

A. According to our engineer we would have to drill it right in the middle of the County road.

Q. You knew where your line was, didn't you?

A. Yes, sir.

Q. You could put it just inside your line on your tract and off the road?

A. Off the road, yes, we could have done that.

Q. But you haven't drilled that well, have you?

A. No, sir.

Q. Now, Mr. Rowan, if I understood you correctly this morning, you said that you had not gotten away entirely from the principles of marginal wells or tracts, but you would keep a certain minimum allowable for tracts, is that correct?

A. I said as a matter of right and wrong I didn't think they were entitled to any minimum. You asked me if I would give it, and I said I would give it.

Q. You are the complainant here, and I want to know just what your scheme is. Now, would you or not allow a minimum to certain tracts, or would you just carry your scheme out without any allowance or minimum?

A. I would allow a minimum, yes, sir.

Q. Now, what is that minimum?

A. Five barrels.

Q. Five barrels for what?

A. Per tract.

Q. For how large a tract?

A. Well, I would say a ten acre tract.

Q. You mean you would allow five barrels for each ten acre tract or a tract that had less than ten acres?

A. Yes, sir.

Q. That had a well on it?

A. Yes, sir.

80 Q. Have you figured out how much marginal allowable there would be under your scheme?

A. No, sir, I haven't.

Q. Have you any idea as to whether or not the marginal allowable would be greater or less than the marginal allowable at this time?

A. I think it would be a lot less.

Q. I will ask you if there aren't a whole lot of tracts in East Texas—I believe you said thousands and thousands of tracts, in your petition here—that are as little as a tenth of an acre that have wells on them that you would have to allow five barrels to under your plan?

A. That is correct.

Q. You don't just know how much marginal allowable there would be, do you?

A. No, sir, I don't know. You would have to take a map and pick out those under ten acres and make a computation.

Q. And you would also have to figure out the reserves, wouldn't you?

A. Not if you have made an arbitrary allowable of five barrels in making that allowable; I think you would have to figure out the reserves under the whole pool, and possibly those tracts might have a greater allowable than five barrels, in which case you would give it to them.

Q. Do you have any accurate information that you can give the Court or us about how much the total marginal allowable would be under your scheme?

A. No, sir, I don't have any.

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Q. You don't have any?

A. No, sir.

Q. All right, sir, now, why do you fix a five barrel figure as being your minimum?

A. It is an arbitrary figure.

Q. Well, now, of course—what do you mean by arbitrary?

A. An arbitrary figure I would fix because I think you ought to make some allowable for a man that has a little tract that has to drill a well on it so as to protect his lease and get his oil out.

Q. Well, how much allowable would you give him?

A. I said five barrels.

Q. Five barrels?

A. Yes, sir.

Q. Why do you pick out five barrels?

A. I think that is enough.

Q. Enough to do what?

A. Sir?

Q. Enough to do what, enough for what purpose?

A. Enough to justify him to drill it if he wants to drill it instead of pooling it with somebody else.

Q. Do you mean to say that a man with three wells on a ten acre tract, if he is allowed only five barrels for that, will get enough back to pay his investment and make any reasonable return on it?

Mr. Tilley:

If the Court please, we object to that testimony on this ground, that the law does not guarantee any man a return on his investment. If he doesn't have

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enough oil under his lease he can't demand of the State to have a return on that investment or recoup his investment unless he had enough in the first instance to justify the drilling of that well.

The Court:

Is it the theory of the State that these parties, before they can enjoin a confiscatory order, have to show a better one?

Mr. Hart:

I think they ought to give some idea of how their scheme will work.

The Court:

The burden rests on them or the Commission?

Mr. Hart:

I think the burden rests on them to show the order of the Commission is unreasonable.

The Court:

If they do that they don't have to give them another one.

Mr. Hart:

If they grant that a total allowable is desirable, and if they can show no fairer way of allocating than the present, I think they have shown no ground of enjoining the present scheme. In other words, if their scheme would lead to waste and is unfair then they have no grounds for enjoining the action of the Commission.

The Court:

You seem to be going into that a good deal at length. I always thought that if you had a confiscatory rate or order that the party could enjoin it and he didn't have to draft another one that was better, that rested with the rate making body or the order giving body.

83 Mr. Tilley:

We think that is the law, Your Honor, and we have authorities to that effect, if the Court would like to see them.

The Court:

Of course, it may have some bearing on the reasonableness or unreasonableness whether you can pick out any better order.

Mr. Hart:

If the Court please, we are in this position, where they agree that proration is a good thing and a certain allowable should be allowed the whole field. Then the question is how are you going to divide it. Now, unless they offer a better scheme than the one the Commission has in effect and has had for over five years there would be no point in enjoining the Commission. Our point, furthermore, in connection with this line of questions that I am now—

The Court:

It might be, of course, that this order would be invalid as to these particular people and might not be invalid as to others.

Mr. Moody:

If the Court please, furthermore, if we show the order is in its application either generally or in this particular case confiscatory in its nature and is therefore an order that can't be enforced, I think that is all the plaintiff would have to prove. The plaintiff has no right to promulgate orders. We have no right to tell them what to do. I think then if the Railroad Commission could show that this is the only order I think that might be—I can't hardly conceive that that would be a defense, but certainly a part of the burden that rests

upon a person who says his property is being taken unlawfully ~~isn't~~ to come in here and show the Railroad Commission some other order. I think when we show our property has been taken we have made a case.

84 Mr. Hart:

I think if they can show their property is being confiscated they have made a case, but if they concede the withdrawal of oil should be limited in some way, unless they can show a fairer way than the one the Commission adopted they have no right to come in and ask for relief, and furthermore what we are trying to show now is the scheme they are proposing would lead to the confiscation of all the people that have drilled these wells since the order was adopted.

The Court:

The scheme he supported is just something he thought was good, but I don't think any burden is on them to put forth such a scheme. The question is as to the validity of the order you have. Of course, when you go into this phase of it with him you can do that, and it may throw some light on whether the order is reasonable or unreasonable, but I wouldn't like to push it to the extent you are pushing it.

Q. Now, Mr. Rowan, you have set a five barrel per tract minimum. Now, that minimum is less than five barrels per well per day, might it not be? In fact, in many instances it would be less?

A. Probably in many cases it would be less.

Q. Now, how much does it cost, an oil well, about?

A. Well, the way I would drill my wells over there it would cost about \$10,000. There has been wells drilled over there, I think, as low as \$7,500.00.

Q. About \$10,000?

85 A. By putting smaller sized casing and tubing than I have been in the habit of putting in mine.

Q. Most of these wells flow for a while and then go on the pump, don't they?

A. Yes, sir; I think the majority of the field is still flowing.

Q. How much does it cost to put a well on the pump?

A. It costs about \$2500.00.

Q. How much does it cost to pump a well after it gets to pumping, do you know about the cost of that?

A. Yes, sir; it depends on whether you have got one well or two wells and three wells or four that your man is looking after. He could do it pretty economically under the right conditions.

Q. About how many barrels would be required, as you see it, to make a reasonable return on your investment in one well, how many barrels a day?

A. You would have to take into consideration the price of oil.

Q. The present price of oil?

A. \$1.25. I would have to figure that up.

Q. Have you made any effort to figure that up?

A. No, sir.

Q. Does your five barrels to each ten acre tract a day have any relation to what oil a man ought to be allowed to take out of his tract in order to pay back the cost of the well?

A. No.

Q. It hasn't any relation to that?

A. No.

Q. Isn't it a fact, Mr. Rowan, that if you set a minimum of anything less than the present marginal limits, which with the Saturday and Sunday shutdowns, amounts to about fourteen barrels a day, you can't operate a well and get back your money and get any kind of return on your investment?

86 A. Well, there are thousands of wells over there that are paid out and pay a nice, handsome return, and I think all of those wells—none of those wells would be plugged, I think, at five barrels a day, they would be still either flowing or pumping like some of those submarginal wells are doing on the east side.

Q. Now, do you mean to say that at five barrels per ten acre tract per day you would be justified in drilling a well of that sort?

A. Not now.

Q. Suppose you had a tract of ten acres that had some oil?

A. That hasn't been drilled?

Q. Yes.

A. I don't think that condition exists over there at this time.

Q. Well, under your scheme it couldn't profitably be drilled, could it?

A. No, sir.

Q. And the oil would not be recovered from under that tract, would it?

A. Not by the man that owned it. It might be by somebody else.

Q. But the man owning the oil under that tract, it wouldn't be profitable for him to drill the well there to get the oil?

A. That is correct. We have some properties in New Mexico where we have oil but it is not profitable to drill.

Q. How much would you allow a man like Mr. Wood?

A. Five barrels per day.

87 Q. Would that pay back his investment?

A. I imagine most of his investment has already been paid back. If it hasn't, and he was starting out to drill that well now it would take him a long time

to get it back at five barrels. He would eventually get it back if the field lasted as long as fifteen years.

Q. Now, Mr. Rowan, I believe you testified that your well is located in what is known as the Fairway?

A. Yes, sir.

Q. That your tract is located in what is known as the Fairway?

A. Yes, sir.

Q. Your tract is somewhat closer to the eastern side of the field than to the western side of the field, isn't it?

A. That is correct.

Q. It is approximately five miles away from Glade-water?

A. Yes, sir, that is right.

Q. Now, your tract, you said it is one hundred per cent drilled on exceptions to Rule 37?

A. That is correct.

Q. The field as a whole, on the other hand, is only fifty per cent drilled up by exceptions to Rule 37?

A. That is correct.

Q. And if you take the average density throughout the whole field, why, you have about the same density as they?

A. That is correct.

Q. The same density of drilling?

A. Yes, sir, the same density of drilling.

Q. And the whole field has been drilled up
88 to the present density on the same plan as your tract, has it not? One man will make an application for an offset and another another, and that led to spacing of the wells over the field as they now are spaced?

A. Yes, sir, that is what happened.

Q. Did you take any cores on the wells under your tract?

A. Yes, sir, we took some cores.

Q. You took some cores?

A. Yes, sir.

Q. Did you report those cores to the Commission?

A. I don't know whether we did or not.

Q. You made the cores as the wells were being drilled?

A. Yes, sir.

Q. You don't know whether those reports were made to the Commission or not?

A. No, sir, I don't know, Mr. Hart. I don't believe they were, though.

Q. Did you core the full sand or just a part of it?

A. No, sir, just a part of it.

Q. How deep did you drill your wells?

A. The deepest well, as well as I remember, is drilled sixty feet into the sand, and I don't know whether that is—yes, I believe that is on the B Lease, too. I believe we have one well drilled sixty feet into the sand on the B Lease, and I believe that is well No. 3.

Q. Did they hit the top of the Woodbine sand at the same sub-sea depth?

A. No, not exactly the same, but very close.

89 Q. How much variation between the wells on your tract?

A. Oh, there may have been a few feet.

Q. Well, isn't it a fact that on the five wells that have been drilled there was as much as thirteen feet difference?

A. That is possible.

Q. In the well logs at the sub-sea depth at which you hit the Woodbine sand?

A. That is possible, yes, sir.

Q. Your well is more favorably situated than either the wells on the west or east of you, is it not?

A. I didn't get that question.

Q. I say your lease is more favorably situated on the structure than the tracts either to the west or east of you?

A. Well, immediately to the east and west, why, I would classify them about the same. Now, if you go, start going westward I think our lease is better as you get further west and better as you get over on the east side. There is an area around there that I classify practically alike, there is not much difference in it.

Q. Well, about how much distance from your well east or west is it that the tracts were about the same?

A. Without looking at the map I would say half a mile to the east and possibly half a mile to the west.

Q. All right, sir, about half a mile each way. Now, the tracts that are on the western edge of the field are underlain by bottom water, are they not?

A. That is correct.

Q. Is that water at a uniform level or is the
90 water at varying levels there?

A. I think it varies a little.

Q. About how much does it vary?

A. I don't know.

Q. Do you have any accurate information on that, Mr. Rowan?

A. We have an engineer here that has a water map, or he has made some cross sections on it. We are going to introduce that in evidence. I don't have that in my own mind.

Q. Has the water gotten underneath your tract yet?

A. No, sir, I don't think it has.

Q. How are you going to tell just exactly how far the water level has reached on any tract unless it starts producing water?

A. There are some wells that have produced through the Woodbine section, and they run Schlumberger logs on them and they show the water on it.

Q. If you run far enough down to hit water you know about where the water level is on that well?

A. Exactly where it is, yes, sir.

Q. Assuming inaccuracies, you know just about?

A. Yes, sir.

Q. On tracts where you don't drill into the water you have to guess where the water is?

A. You have to project your water line, yes, sir.

Q. Like you project your contour lines, and things like that?

A. Yes, sir.

Q. You have to guess the best you can where the water line is?

A. I don't believe it a question of guessing.
91 you can assume it is fairly normal.

Q. Does the water rise on a horizontal plane, taking the field as a whole?

A. Yes; I think you could say substantially, yes, that it rises on a horizontal plane. Certain areas might pull in there and may show to be a little bit higher in certain areas than others.

Q. Sir?

A. In certain areas it may show to be a little bit higher than others.

Q. Which areas are those?

A. Well, I don't know. We have a water map here, our engineer has a water map here, and we are going to submit that as information.

Q. You don't have that information yourself?

A. I don't have it in my mind, no, sir.

Q. You submitted this morning a list of tracts which are drilled to a greater density than your tract, townsite areas?

A. Yes, sir.

Q. Which one of those tracts is within five miles of your lease, if any of them?

A. Those wells in the Gladewater Townsite are, I think, within just about five miles.

Q. Are those wells draining any of your oil?

A. I don't think so, no, sir.

Q. They are from the west, and the water drive comes from the west? *

A. Yes, sir.

92 Q. So, the dense drilling in those Gladewater Townsites you submitted to the Court this morning, that doesn't cause any loss of oil from your tract, does it?

A. No, sir.

Q. Take the Kilgore area, how far is Kilgore from your tract?

A. Kilgore is twelve or thirteen miles.

Q. Are you losing any oil to the wells down there in the Kilgore area?

A. I think we could; I think your drainage could be either north and south or east and west if you developed a pronounced low pressure area to the south of us or to the west of us or to the north.

Q. Do you mean to tell the Court, Mr. Rowan, that there would be a drainage of as much as eighteen miles in the East Texas field?

A. There would be a drainage?

Q. Yes, sir.

A. Well, if you had a lot of wells in between there the drainage could be gradual.

Q. I am asking you if you are making the statement to the Court that it is your opinion that you have lost oil to the wells in the Kilgore area, eighteen miles away?

A. I am not going to make that statement, no, sir.

Q. Well, what about the Overton area—I believe that was another one of those areas?

A. Yes, sir.

Q. How far is Overton from your wells?

A. Farther still.

93 Q. About how far away?

A. I would say twenty miles, just guessing at it.

Q. Now, Overton is on the west side of the field, isn't it?

A. That is correct.

Q. Instead of oil being driven from your tract toward their tract, oil is going the other way, isn't it—it is going from west to east by the water drive?

A. Yes, sir.

Q. So you are not losing any oil to the Overton tracts, are you?

A. No, sir.

Q. What about London Townsite, how far is that away from your lease?

A. Well, I am going to estimate it offhand. I have driven it, and I am going to estimate it at about thirty miles.

Q. There is not any of your oil going down to those wells around London, is there?

A. I doubt it, I doubt it very seriously.

Q. What other areas did you include in that list?

A. That is all, Mr. Hart.

Q. That is all?

A. Yes, sir.

Q. Well, you are not losing any oil to any of those areas, are you?

A. No, sir; we just picked that out as a general idea of how the field has been developed. There are certain tracts, of course, to the east and north of us that have been drilled up on a considerably greater density. We have just picked those out as general areas to show that there were general areas in there that had been
94 drilled up to a very low density.

Q. You don't take the position that because there may be some inequalities that the whole scheme will have to be thrown overboard, do you?

A. No, sir.

Q. And when you consider the situation in the whole you have as great a density of drilling as the whole field, don't you? —

A. Yes, sir.

Q. So, you really haven't got any complaint on the density of drilling of wells, have you?

A. No, sir, not on the basis of density of drilling, no, sir.

Q. Now, where are the biggest potentials in the field, Mr. Rowan?

A. They are in the middle of the field, what we term the Fairway. We have used that expression before.

Q. The lowest potentials are around on the edges, aren't they?

A. I believe you will find the lowest potentials on the east edge.

Q. The lowest potentials are on the east edge?

A. Yes, sir.

Q. And generally the potential contours come around until you get there in the Fairway right around your lease, and you have the biggest potentials in the whole field?

A. That is correct, yes, sir.

Q. And your contention also is, is it not, that the greatest reserves are in that part of the field?

A. Yes, sir.

Q. There is some connection between the potentials and the amount of reserves under the tract, is there not?

A. I think the thicker your sand—the potential would indicate the thickness of the sand, but

95 I don't think it indicates the amount of reserve you have.

Q. Now, let me get that. You say the potential indicates the thickness of the sand but not the amount of the reserve?

A. That is right.

Q. Explain that. What is the difference between the thickness of the saturated sand and the amount of the reserve?

A. The measure of an oil reservoir—if you wanted to estimate the number of cubic feet of air in this room you would have to have length and width and breadth, and the same thing if you were estimating feet of water in the Buchanan Dam, you would have to take the cubical contents to estimate the amount of water in that dam. And when you estimate the number of barrels in an oil reservoir you have to estimate the length, depth and thickness. We use acreage and then thickness of sand, which we call acre thickness of sand, but the potential doesn't indicate the thickness.

Q. I thought you did say it indicated that but not the amount of reserve?

A. I said that it indicated possibly the thickness of sand, but I didn't say it indicated the acre feet of sand thickness, because you have to take three dimensions to get the amount of reserves you have underground, not just one.

Q. Yes, but if the amount of potential indicates the thickness of sand, you know the area on the surface, don't you?

A. Yes, sir.

Q. Wouldn't it be a simple matter to calculate it?

A. That is what we have done.

96 Q. Then, do you think a potential method is a fair method of determining the amount of sand thickness?

A. I think in your thicker sand areas you are going to get bigger potentials, but I think that the actual sand thickness that you can core or run a Schlumberger on is more accurate than the potential test you run.

Q. But you do concede that the potentials reflect, in some amount, the amount of saturated sand thickness under a lease, is that correct?

A. Yes, sir, that is correct; in East Texas it indicates somewhat that.

Q. You say there are more accurate methods of determining thickness?

A. That is correct.

Q. How do you do it?

A. Either by coring or by a Schlumberger log.

Q. How many wells in East Texas have been cored?

A. I don't know.

Q. Sir?

A. I don't know. There are thousands of them, I guess—not from top to bottom.

Q. Isn't it a fact that less than five per cent of the wells in East Texas has been cored?

A. I don't know about that. I would say from top to bottom, yes, a complete section.

Q. Well, you have to take a complete section of sand to have any accurate information?

A. Yes, sir, you would have to, to have accurate information.

Q. And there have been about only five per
97 cent of the wells cored?

A. Yes, sir; but there have not been that many potentials taken. They have only taken the potentials on a hundred wells, as I understand, or 103, so you would have much more information on core records than potential records.

Q. It is pretty easy to take a potential on a well, isn't it?

A. It is pretty dangerous the way you are taking them.

Q. But it is easy to take a potential test on a well?

A. Yes, sir—it can be done.

Q. How are you going to core a well after it has been drilled?

A. You can't do it unless by side cores. You can run a Schlumberger test as to the thickness of the sand.

Q. Do you know how much a Schlumberger test costs?

A. Yes, sir.

Q. About how much?

A. Well, they make a \$50.00 service charge, and then charge 3¢ a foot down to where they start taking the reading, which in East Texas would be where you start taking the reading, because you wouldn't want a Schlumberger for the upper part of the hole—which would be three times thirty-five or thirty-six.

Q. Doesn't the total cost run about \$300.00 a well?

A. No; it would cost you in East Texas, I think, about \$175.00.

Q. Now, how accurate—how far does that Schlumberger test indicate the conditions in the sand around the well, how far out in the sand would it indicate the conditions in the sand?

A. How far out?

98. Q. Yes, sir.

A. It wouldn't indicate the conditions out in the sand, it would only indicate the amount of sand you had and where the water was, the porosity.

Q. Right there immediately around the well bore, is that correct?

A. Yes, sir.

Q. Now, if the well is not drilled all the way through the sand you don't get any information by a Schlumberger test unless you drill a well all the way down to the bottom of the sand and into the water, do you?

A. Correct; it would only give you a reading on that portion of the sand you run it into.

Q. Most of the wells are not drilled through the sand, are they, into the water?

A. In the last year I would say a great many were drilled through the sand, and Schlumbergered and the holes set in casing.

Q. You couldn't use a Schlumberger on those kind, could you?

A. You wouldn't want to on those that had already been Schlumbergered and a pipe set in unless you just wanted to make another test or check your first one.

Q. Now, I am going to get at this. You say there is a better way the Commission could use in determining the sand thickness than the potential, which you say reflects it to some extent. Now, would you advocate taking Schlumbergers on the wells, or how would you advocate finding that out except by potential?

A. I think I have several different ways. In
99 the first place, you have 25,000 wells, a little over that, which show the top of the sand. You can certainly contour the top of the sand, you know where the sand begins. And on the west side of the field you know where the water level is. On the east side of the field there have been a great many wells that have drilled through the sand, and I believe there has been possibly six hundred Schlumberger tests that have been run in various sections of the field. And you could take all that information and supplement it with your core records that have been made in various areas in the field, and I think you would find that you would have a pretty accurate picture of the sand thickness.

Q. Well, now, as to the top of the Woodbine sand, is that regular or irregular?

A. It is slightly irregular.

Q. It is irregular, isn't it?

A. Yes, sir.

Q. If you went to contouring by the top of the sand, running contour lines, you would inevitably have some inaccuracy, wouldn't you?

A. Well, they would be subject to the same inaccuracies you have on any contour line, that is all. You have so many wells in there that it gives you points of contact. I think in East Texas, with all the drilling that they have done, you would have about as accurate a contour map on top of the sand as you could possibly

have in any field I have ever had any experience with.

Q. Now, if you have as much as thirteen feet difference on one lease there, your lease, why doesn't that same variation occur over different tracts in the field?

A. Probably there is some variation all the way over.

Q. Now, then, the top of the sand is irregular, is it not, as you have stated?

A. Slightly irregular.

Q. And what about the bottom of the sand, is that regular or irregular?

A. Well, eventually—originally, I believe—

Q. You mean to say—

A. You mean on the east side, now, or the west side?

Q. Well, take it all over?

A. Well, on the east side I would say that it was slightly irregular, on the east side, the bottom of it, and on the west side originally I think probably the water all laid underneath that oil bearing formation on a pretty horizontal plane.

Q. Well, now, has it changed in level since those wells were originally drilled?

A. The water level has changed some.

Q. And it is now irregular, is it not?

A. Slightly irregular.

Q. And you have the sand thickness, that is irregular, the top of the sand is irregular, and the water level is irregular?

A. Yes, sir.

Q. Now, would you take both of those factors into consideration under your method if you were undertaking to determine the amount of reserves under any tract?

A. Irregular on top and bottom?

101 Q. No. Would you take into consideration the top of the sand and the water level in determining the amount of reserves that were in place under the tract?

A. You would have to take averages, -yes, sir, average it up.

Q. You would have to average it up?

A. Yes, sir.

Q. Would you give a man actually the thickness under his tract or would you give him an average?

A. Give him what he had under his tract.

Q. How would you find that out?

A. I would determine the average top of it, and if there were irregularities in the bottom of it I would determine the average bottom of it just like you do on a land survey on top of the ground, and then give him that average. It would be substantially correct.

Q. You have two elements which you say are irregular and which you say you would have to try to arrive at some guess in determining the amount of reserves, the irregular top of the structure and the irregular bottom where the water is?

A. Slightly irregular on both, I would say.

Q. What about the character of the sand there, is that all one sand of the same character, or not?

A. No, it is not. You mean all over the entire field?

Q. Yes, or on your tract or on the entire field?

A. No, sir, it isn't all of the same character.

Q. What are the various kinds of sands there?

A. Well, it varies; on the east side you have
102 some sand that is shaly, and in the middle of the field you have, right in the top of the sand, you have a little ash, and farther on down in the sand you have some gravel in the middle of the field, and you have some shale streaks there in the middle of the field.

Q. In other words, Mr. Rowan, the East Texas Woodbine sand is not a homogeneous section of sand, is it? They have all sorts of variations within that reservoir?

A. It is not a solid section of sand, there is some variations.

Q. There are some variations?

A. Yes, sir.

Q. In other words, in some areas you will find tight sand, will you not?

A. Yes, sir.

Q. In other areas you will find lenses of shale and volcanic ash which impedes the free movement of the oil?

A. Yes.

Q. You find in some areas sand that is so thick or big that it is almost gravel, don't you?

A. Yes, sir. I don't know that I would find any grains, that I have ever seen any grains of sand as big as gravel. I have seen considerable gravel in the sand over there.

Q. Well, now, how would you find out under any particular tract, under your method, of what the character of the sand was underneath any particular tract so that you could allow to it a fair share of the oil which would give you a better idea of the character of the sand than on the potential test?

A. I think the sand in the East Texas field is fairly uniform. I think it is uniform enough that you could assume its uniformity.

Q. Haven't you just said that it is not uniform, that it has a whole lot of variations in it?

A. That is correct, but those variations are on the east side, middle and west side and on the north and south, that is where they are.

Q. But you would take an average and give a man something based on an average instead of actually trying to find out what was under his tract?

A. I wouldn't try to find out exactly how many inches of ash or shale he had in there, although, if that particular operator wanted to find out he could find it out.

Q. You would put the burden on the operator?

A. I would take the information the Commission has now, and use that, or they could get it.

Q. You would put the same burden on the operator; if he is not satisfied with the potentials he could get another made?

A. He could go get one if he wanted one.

Q. You haven't asked for any potential tests on your well, have you?

A. Yes, sir, I asked for one.

Q. When was that?

A. It was back—right after the shutdown period.

Q. When this formal proration order went into effect?

A. Right after that.

Q. You got your test made, did you not?

A. Yes, sir.

Q. I believe you talked about Mr. Griffin coming out there. Isn't it a fact that Mr. Griffin pointed out to you that you might fix your equipment so you could get a higher potential, and you said it was all right, to just go ahead?

A. I think possibly so. I think he and I did discuss it.

Q. You haven't complained as to the way the Commission treated you on that test, have you?

A. No, sir.

Q. The Commission has been very fair in assigning you your potentials, isn't that correct?

A. As far as the potential is concerned I have no complaint.

Q. Then, what you were talking about this morning, so much back pressure and things of that kind, you don't mean to say the Commission treated you unfairly in an assignment of potentials to your lease?

A. No; what I meant to say was under similar conditions with these other wells, that I thought my well probably was as good as any well in the field, maybe, that made a 1,000 or 1,050 or 1,100. I wasn't making any

complaint as to the manner in which the Railroad Commission—as to the test.

Q. While I am talking about that, you spoke about the gas came out of the oil, I believe, when you were having that potential test made; about it going down the valley there for some distance?

A. Yes, sir.

Q. You asked Mr. Griffin to take that test early in the morning?

A. I suggested it be taken early in the morning.

Q. You were willing to do that because you
105 would get a higher allowable?

A. That is correct. The other potentials had been taken during the shutdown period, and during the shutdown period the bottom hole pressures had built up, and by taking these potentials at different scattered places over the field they were able to utilize all of the energy that was stored up there. In other words, there wasn't any other wells flowing that would be flowing energy away from them, and they came along there—I came along there and asked them to take a potential on my well, and Mr. Griffin suggested that the early morning was better because the practice was to flow the wells at night, and a good many of them would have been shut down, and possibly by that way I might be able to use the reservoir energy a little bit better. That is the reason it was taken early in the morning, at his suggestion.

Q. In other words, you took it early in the morning so you could get a higher potential?

A. That was the idea, yes, sir.

Q. If you had waited until noon, after the air had warmed up, the gas could have escaped up into the air without danger of fire, couldn't it?

A. To a greater extent than it did, but I still think that due to the wet content of the gas it would still have

been heavy enough to have hung on the ground to a certain extent, and have been a fire hazard.

Q. Do you mean from that that you ought never to taken a potential test on a well to determine how much oil is to be allocated to it?

A. I don't thing you should take it without
106 putting it through a trap or a separator.

Q. You still think the potential test is a method of determining the potential capacity of a well, don't you?

A. Not a three hour period, I don't think it determines it except for that three hour period.

Q. Would you let the whole field run wide open if you wanted to know the potential capacity, or would—how long would you let it run wide open?

A. Not for three hours. If I wanted to get a real potential—of course, I realize with 20,000 wells they couldn't take a potential test on that whole field running it wide open for twenty-four hours. I realize that is impossible, but that information would give you a lot more information than the test they make.

Q. You understand, Mr. Rowan, the Commission has to go at it in a practical way, and if it not practical the Commission cannot follow it?

A. That is correct.

Q. You wouldn't advocate a method of change of taking potentials so they would run the whole field wide open for three hours, would you?

A. I think it would be a physical impossibility to do it.

Q. So the Commission has to do about the best they can, and the best they can is to take a potential without holding the field wide open, the entire field, but just on one well at a time, taking it on just one well at a time.

107 A. If they want to base an order on potential, if they want to do that, that is about the only way they can do it.

Q. They have adopted about the only way they can, if they are going to take it on a potential basis?

A. They could take more wells; and if they were going to take more wells they could take one a day over a period of time, and they could have every well in the field tested. They can keep on taking more than one hundred.

Q. But anybody that feels like he is not getting enough can get a potential made.

A. If the Railroad Commission had arbitrarily allowed him 200 or 300 I think he would be crazy to come in and complain and ask for a test to be made. And, of course, most operators know what their wells will make, and they wouldn't come in and ask for a test on a well that they are already getting more allowable or potential assigned to it than it would make. Consequently, those operators are not going to complain.

Q. You can ask for a test of the whole field, can't you, all key wells?

A. I don't know whether they ought to permit that.

Q. If anybody feels he is being aggrieved, either by the potential on his well or the field as a whole, he can have a new test made of the key wells, can he not?

A. Probably on key wells, but I don't think on every well in the field.

Q. You are not saying they wouldn't do it, are you?

A. No, sir.

Q. Now, you talk about the regularity of that sand. Do you know of instances there in the East Texas field where you have flowing wells within a very short distance of pumping wells?

A. Yes.

108 Q. That occurs?

A. Yes, sir, that occurs.

Q. In many instances throughout the field, does it not?

A. Yes, sir.

Q. Don't you in some cases have flowing wells in areas, brought in in areas which were generally considered to have gone to water, areas where there could be no more oil produced?

A. That condition might exist, but I never heard of it.

Q. Well, on the west side of the field haven't wells been drilled where other wells have been plugged and abandoned, and you have gotten wells flowing oil from them because of the existence of these lenses in there?

A. I don't think the lenses probably had anything to do with it. I think in the early days you drilled a lot of wells into the water, and by virtue of lack of experience they let them drown themselves out, and you couldn't plug them back, and other people have gone in and drilled a well, just barely touched the top of the sand, and are skimming it off the top, and those wells are producing.

Q. What would you do about those wells that are just barely making their allowables now, would you have them plugged in?

A. Not unless they are making excessive water. If they are making excessive water I think they are creating waste, it is creating waste to let them produce.

Q. Now, do you know how the porosity of the East Texas sands are calculated, do you know what the porosity is?

109 A. I have heard estimates made on it, yes, sir. I never made any test on the sands myself, or I never had any tests made, any laboratory tests made, but I have heard that tests have been made and heard what the figures were.

Q. Do you know how much variation there is in porosity between different tracts there or different areas in the field?

A. It varies some, yes, sir.

Q. How much does it vary?

A. Oh, I would say it varied as much as, maybe—

Mr. Moody:

Your Honor, the witness obviously doesn't know.

The Witness:

It is just a guess.

Mr. Moody:

He testified all he knew was what he heard people say.

Mr. Hart:

You offered him as an expert.

Mr. Moody:

Yes, sir, but he is not an expert in all things, and we have engineers here.

The Court:

Isn't this evidence more or less negative? Haven't you witnesses of your own to testify to those matters, and who will testify affirmatively instead of fishing around with this witness, instead of getting this evidence which isn't very convincing?

Mr. Hart:

As I understand, Your Honor, they offered him as an expert.

The Court:

I know that.

110 Mr. Hart:

If he will say "I don't know", that is all I want.

The Witness:

I said I don't know as a matter of fact.

The Court:

There is, of course, the rule that on cross examination you ought to develop only those matters which were gone into on the original examination. Now, if you want to depart from the original examination to prove up independent matters of your own, then if you find the witness doesn't know about it his evidence is negative. I would quit him and make my proof by witnesses that knew, your own witnesses. You are sounding him out on a great many matters that they didn't ask him about.

Mr. Hart:

I understood, if the Court please, that he had offered a formula here which is summarized in this sheet here, and I was trying to find out what factors were taken into consideration.

Mr. Tilley:

He said an engineer prepared it.

The Witness:

That is right, the engineer prepared it.

The Court:

How long have we had this witness on the stand? He has been on almost all day. I have been going right along with you without making much complaint because I felt that the first two or three witnesses would break the back of the case, but we can't afford to take too much time.

Mr. Hart:

I will try to hurry along as well as I can. I don't know whether they are going to put on any witnesses to substantiate this schedule, and for that reason I want to know if he knows anything about it.

111 The Court:
All right.

Q. Mr. Rowan, do you know what factors ought to be taken into consideration in trying to arrive at the reserves, the oil reserves under a tract.

A. Well, I will tell you how I have always estimated mine, and I haven't estimated them like an engineer would estimate them, but I think they are fairly accurate. I had experience—

Q. Excuse me just a minute. Name the different factors you take into consideration in determining the amount of recoverable oil under a tract?

A. Acre feet of sand thickness, in the East Texas field.

Q. All right, that is one.

A. That is a factor that I would use.

Q. Is that all?

A. And I would multiply it by 800 barrels, and when I say acre feet I mean Woodbine area.

Q. Are those the only factors you would take into consideration?

A. Yes, sir; in making my own estimates that is all I took into consideration.

Q. Is that the method you are proposing to the Commission?

A. No, sir, that is not necessarily the method I am proposing to the Commission.

Q. What are you proposing?

Mr. Moody:

It is immaterial what he is proposing. He is proposing that the order as enforced by the Railroad Commission confiscates his property.

The Court:

I think so.

112 Mr. Hart:

I submit that where the Commission tries to work out a fair method he can't come in and say "I am not going to give you any help. I admit that potentials reflect these things, but I am not going to tell you how to do it better", and then get an injunction.

Mr. Moody:

He misunderstands the witness' testimony. He doesn't say that, and we don't want to appear as being in the attitude, Your Honor, as saying "your order is wrong and we are not willing to help you." We have been at it, Mr. Rowan testifies, for five years. We don't want to take that attitude at all, or have it appear that we are not willing to try to help arrive at a more equitable plan, but we take it that the effort to attempt to discuss those things here is futile. The Commission has to find its own way of writing an equitable order.

The Court:

I think it is very much like a rate suit. The Court can't make a rate, but the Court can enjoin a rate. I can't make a new one.

Mr. Hart:

If the Court please, in a rate case the company has to come in and show the Court the facts with reference to it, and indicate what would be a fair rate.

The Court:

When you get down to a legal proposition, isn't about all you are doing with the witness is arguing with him?

Mr. Hart:

I am trying to find out, if the Court please, what his method of proration would be.

113 The Court:

He is not the Commission, he doesn't have to make an order, all he has to do is pass on the one they make. If it suits him, all right. If it doesn't, he can file suit.

Mr. Pollard:

If the Court please, I think they are showing there is no more fair or reasonable way that he knows of than the present.

The Court:

That is a matter of argument, isn't it?

Mr. Pollard:

No, it is a matter of fact in how they can reach that allocation, Your Honor.

The Court:

Well, I don't fancy the way you put it up to him. You ask him to tell you how he would do it. I don't think he has to do that. I don't think he has to do that at this hearing.

Mr. Hart:

What I meant to say was what method was he proposing. He has proposed a method by his petition in this case. He says "You ought to allocate the total allowable in the same proportion that the reserves" under his

tract, the reserves of recoverable oil under his tract, bear to the whole field. I want to find out if there is any more accurate way of determining that, than by taking potential tests.

The Court:

You can do that, but don't put him in the attitude of where he has to furnish the handle. You are just arguing about nothing here. You can ask him about the facts if you don't keep on insisting he give you another schedule.

114 Mr. Moody:

Your Honor, let me say this, it might create the wrong impression on the Court's mind, since the pleadings—I think Mr. Hart misconstrues the pleading. The rule of property rights as now declared by the Courts is that his right is to produce in that proportion which the amount of oil underneath his land bears to the total recoverable oil in the common pool. It is merely a pleading of his right and not a proposing of a matter to obtain the enjoyment of that right, but merely a pleading that the present rule doesn't permit him to enjoy that right.

The Court:

Go ahead.

Mr. Hart:

Would the Court consider this a fair question, what fairer scheme would there be of allocating a potential—allocating the allowable other than on a potential basis?

The Court:

If you want to ask him that, all right.

Mr. Tilley:

We will object to it, if the Court please. It is a conclusion on his part.

Mr. Hart:

He is being offered as an expert.

Mr. Moody:

He is not an expert on railroad commission.

The Court:

They cross examined him, and he says their method is unfair. I don't think the burden rests on him to dig up some new method, but if he happens to dig up one he can say so.

Q. Mr. Rowan, do you know of any fairer method, or one that takes into consideration less factors that are unknown?

A. I think there are three or four methods that could be used that would be fairer than the one you are using now.

Q. What are those?

115 A. I think you could take a method based on acre feet of sand thickness with a correction factor for bottom hole pressure and it would be fairer than the one you are using now, and it would tend to possibly prevent waste more than the one does now. I think there are other plans that you could use that would be fairer than the one you are using now.

Q. What are they?

A. You could take acreage times potential and it would be fairer than the one you use now.

Q. All right, what else?

A. Well, I don't have any in mind right now, but I expect you could use some kind of factor for bottom hole pressure—I said acre feet of sand thickness with corrections for bottom hole pressure, didn't I, at first?

Q. I think so.

A. You could take acre feet of sand thickness with corrections for potential, and that would be fairer than the one you are using now.

Mr. Hart:

Now, is it the ruling of the Court that we cannot go into the question of whether the method he has proposed is fairer, whether his methods are fairer?

The Court:

You can argue it out with him if you want to. I will give you broad latitude in cross examining him.

Q. You spoke of a factor based on sand thickness and bottom hole pressure?

A. Yes, sir.

116 Q. Would you just take the total sand thickness, disregarding any differences in porosity, permeability or the character of the sand?

A. That is correct.

Q. Or the amount of the connate water in the sand?

A. That is correct.

Q. You would disregard all of those differences?

A. I would in my plan. The Commission could regard them if they wanted to. And I think it would make it a lot more scientific and accurate, but to make it so the average man out there could understand it that owns the lease, I would disregard them. I don't think you would do a lot of inequity if you disregarded them.

Q. Did the potential method disregard porosity and permeability in determining the character of the sand?

A. I don't think it has a lot to do with porosity; probably it takes into consideration permeability. It doesn't indicate the drainage area around the well.

Q. It indicates permeability?

A. Yes, sir.

Q. Also an indication of bottom hole pressure, which is another factor you consider?

A. I think it is an indication of bottom hole pressure to an extent, but it leaves out one thing I think necessary in any order, in order to give consideration to property rights, and that is that it doesn't take into consideration the amount of oil that a man owns in place. I think there are three dimensions you have to have to that.

117 That is length and breadth and depth. I don't think a man can produce oil until he has it there. In other words, if you drilled on top of the Sabine Uplift and you got a dry hole the hole wouldn't do you any good. You have to have sand, and measure the drainage area to compensate for the oil reserves you have in place.

Q. The thickness of the sand doesn't help unless it is saturated with oil, does it?

A. No.

Q. Being non-porous and non-permeable and saturated to a considerable extent with connate water and filled with lenses, if it is like that you don't have a recoverable oil under there?

A. No, sir. I think they ought to take into consideration,—as I said, I think it would make it much more complicated than to take the known Woodbrine section and use that on an acre foot basis.

Q. You mean it would be impracticable to determine all of those factors that you are speaking of, determine them exactly?

A. I don't think it is impracticable. I think you would have to have quite a force just like you would if you take the potentials on every well in the field at one time. I think by this latter method you could get all the information you wanted, but it would be a pretty big job.

Q. Now, Mr. Rowan, you testified as to what your original reserve under your tract was. What did you say that was?

A. We estimated a million and some odd
118 thousand barrels. 1,506,000 barrels, wasn't it?

Q. How much per acre foot?

A. Oh, this particular estimate wasn't made by me, it was made by my engineer.

Q. Well, now, Mr. Rowan, do you mean to say you are not vouching for that, you don't know anything about it, you are just quoting the engineer?

A. Yes, sir. The estimates I made are higher than the one he made, and we used his lower estimates, and he makes estimates on the basis of ultra conservatism.

Q. How much recoverable oil is there under your lease?

A. Now or in the beginning?

Q. In the beginning.

A. In the beginning we estimated 1,506,000.

Q. That much per acre?

A. No, sir, not per acre. I don't have the figure per acre.

Q. Let's get that. That is what you alleged.

The Court:

He had twenty-four and a fraction acres; that is just arithmetic. Is there any difference in the tracts?

The Witness:

No, sir. My estimate was 70,000 barrels per acre. This is going to run about 60,000 barrels, the schedule I put in the record this morning is going to run about 60,000. Like I say, it is slightly lower than the estimates I made.

Q. When you were testifying at Fort Worth in the case up there in 1933 you estimated 45,000 or 50,000 barrels per acre?

A. Correct.

119 Q. Now you say how many?

A. Now I say 70,000.

Q. 70,000?

A. Yes, sir.

Q. Trying to determine those reserves and allocations on that basis is a pretty uncertain way of allocating?

A. I don't think so. We have developed a lot of information on the field today we didn't have then during that period of time. Then we didn't know whether the allowable was going to be a million barrels or three hundred thousand, or what. I think the rate of withdrawal is going to have something to do with the recovery you get per acre foot.

Q. Did that have anything to do with the oil in place?

A. Originally?

Q. Yes.

A. Yes, it had something to do with the oil in place, the recoverable oils; the oils are there, and the recoverable oils depend on the method in which you produce it. I assume that restricted rates of flow are a conservation measure. And the reason they restrict them is because ultimately there is a greater recovery. If you open the flow wide you would probably have lesser recovery than under restricted flow. And at the Fort Worth hearing we didn't know the rates of production or flow.

Q. All right, but what was your estimate of the original oil in place under your tract?

A. 45,000.

Q. 45,000 barrels?

120

A. Yes, sir.

Mr. Moody:

Does it say recoverable there—you have your testimony there—was it recoverable or just oil in place?

Mr. Hart:

I am talking about the recoverable oil originally in place.

A. My estimate at Fort Worth was 45,000 per acre, 45,000 barrels per acre.

Q. You now estimate 70,000?

A. That would be my estimate. My engineer's estimate is 60,000.

Q. What is that due to, Mr. Rowan?

A. I think we have more information on the field than we had then, and we have a lot more information as to the way the field is going to be handled, that is, the rates of production, the rate it is going to be taken out, and all of those factors. You have a lot more information to base an accurate estimate on now than you had then. I think most engineers have changed their opinions.

Q. In other words, those estimates include variable factors which would cause inaccuracies in a method of allocation which would depend on determining the amount of reserves in place on any tract?

A. The amount of recoverable reserves, yes sir, but not the amount of reserves.

Q. How much recoverable in place under your tract do you think you have now?

A. We estimate 1,151,168.

Q. How much oil has been taken out, then,
121 355,254 barrels?

A. Yes, sir, 355,254 barrels.

Q. You have taken that out?

A. Yes, sir.

Q. You mean there is that much less oil in place under your tract than there was originally?

A. Do I mean there is any voids down there?

Q. No, sir. What did you say?

A. Voids.

The Court:

He asked, you if you had taken out that much oil.

A. Yes, sir, I have taken out that much oil.

Q. How much oil is in place under there now? Is there that much less oil actually in place now than there was at the beginning of production of your lease?

A. I imagine so, unless I have drained it from somebody else.

Q. Haven't you drained from other people so that you have practically the same amount under your tract as you had at first?

A. I don't think so.

Mr. Moody:

You mean recoverable oil?

Mr. Hart:

Yes, sir.

A. I don't think so, no, sir.

Q. What has taken the place of all this oil you drained out from under your tract?

A. Oil has taken the place of it.

Q. Other oil has taken the place of it?

A. Yes, sir.

Q. Then, you have under your place at this time practically the same amount of oil you had under there at the time you drilled your well?

A. No, sir, I don't think I have the same amount of oil that I had then. I think the oil is there, but the pressure, it takes pressure to get oil to the surface.

Q. How much is the pressure on your tract at this time?

A. I don't know, Mr. Hart. We haven't run any—you understand, we don't have any engineer working for us. No pressure bombs have been run. We asked the Railroad Commission for contour maps, and we are willing to stand on them. I think the pressure contour maps put out by the Commission are accurate.

Q. You don't know the pressure on your lease?

A. No, sir.

Q. They are flowing wells, though?

A. Yes, sir.

Q. How long do you think they will continue to flow?

A. Well, I don't know. That is a pretty hard thing to figure, there are so many variable factors in there you would have to take into consideration.

Q. Assuming conditions remain like they are now, how long do you think the wells will flow?

A. Possibly five years.

Q. And about how long do you think the wells will continue to pump after that?

A. I don't know. We estimated the life of the field, if they continued to produce as much oil as they are producing now, as fourteen years.

Q. Now, Mr. Rowan, you say you got just
123 as much oil, that you have just as much oil in place under there as you had when you drilled your first well?

A. I think that is right, yes, sir. I don't say I have as much recoverable oil.

Q. You say you haven't got as much recoverable oil?

A. Yes, sir.

Q. Do you mind telling me why you think there is not as much recoverable oil under there as when you drilled your first well?

Mr. Moody:

He has answered that, if the Court please. It is repetition.

Mr. Hart:

I don't think he has.

The Court:

I thought he said the pressure was lower.

The Witness:

That is it exactly.

Q. Is pressure the only factor you are considering there?

A. That is all, yes, sir, that is the only factor I am considering.

Q. There is not any water under your lease now, is there?

A. I don't think so. The information we have is that there isn't.

Q. The reduction in pressure is the only factor you think reduces your recovery of oil by that much?

A. Yes.

The Court:

At what bottom hole pressure did that come in at?

The Witness:

About 1600 pounds, Your Honor.

Q. How much is it on your tract, about 1150 pounds?

A. I believe so, Mr. Hart. I would be willing to take the Railroad Commission's statement on that. Like I say, we don't have any pressure bombs, and they measure them in key wells,

and I think their information is all right, I don't question that, and if it shows 1100 I think that is all right.

Q. The wells will continue to flow until you get down to about what pressure?

A. Well, all I have is hearsay information, and that is on the east edge there, I think about 700 pounds bottom hole pressure, 700 or 800 pounds. About 800 pounds, I guess.

Q. Do you know how many pounds the pressure is being reduced per year under the present withdrawal from the whole field?

A. No, sir.

Q. Isn't it something like twenty-five pounds a year?

The Court:

Counsel, it seems to me you ought to get that from witnesses who know it. Make it affirmative rather than negative.

The Witness:

147,000,000 barrels produced, and I was under the impression the pressure dropped about one pound or eight-tenths of a pound per million barrels.

The Court:

Why not get that from somebody that knows. You have engineers that know, haven't you?

Mr. Hart:

I think we have.

The Court:

Let's not have the record loaded up with "I think" or "I guess".

Mr. Hart:

I have asked him these questions because he has testified about them very broadly, and I wanted to know if he really knew anything about it. Of course,
 125 if he doesn't know I don't want to press the matter any further.

(At this time a short recess was taken, at the conclusion of which the following proceedings were had:)

Q. Mr. Rowan, I believe you stated toward the beginning of your testimony that you agreed with the restriction of the field as a whole to a certain total allowable because it helped preserve the pressure?

A. Yes, sir.

Q. And under the present amount of withdrawal as permitted by the Railroad Commission there has been a very slow decline in the bottom hole pressure, is that correct?

A. Substantially so, yes, sir.

Q. Isn't it correct within the last year on your lease the bottom hole pressure has dropped only about eight pounds?

A. I don't know, Mr. Hart, I really don't. I would be willing to accept the Railroad Commission's figures on that.

The Court:

That is repetition.

Mr. Hart:

Sir?

The Court:

I say that is the fourth time we have that in the record. He is willing to take your figures on it. I

wouldn't ask him that anymore. I don't want to hurry you, Counsel, but I think I have been indulgent.

Mr. Hart:

I have asked him about different things, and that is the reply he has made.

The Court:

That is the only thing he has offered to take your word on:

126 Q. Assuming that the drop has been about eight pounds per year, how long, then, would it be before the pressure on your lease became so low your wells ceased to flow?

A. I could figure it out. You said it was 1100?

Q. About 1125?

A. 1125, and I believe the wells go to pumping at 800. That is 325, and I can divide eight into that, eight into 325, and I get—

Q. Something over forty years?

A. Yes, sir.

Q. Before your pressure would be so low that your tract would have to go on the pump?

A: Yes, sir.

Q. Then, after your tract went on the pump there would be a certain time in which you could pump oil, is that correct?

A. According to that calculation, yes, sir.

Q. So that the drop in pressure has not affected very much the amount of recoverable oil under your tract?

A: Affected me?

Q. Yes, sir.

A. I think it has affected me some. This statement I put in the record, I think, showed the time element is affecting us quite a bit, too.

Q. You mean because you are allowed to recover only a small amount at one time that the spread of the time that you are allowed to recover amounts to confiscation of your property, that is your contention?

A. No, sir. It looks to me like this chart that I put in here indicates that long before we have exhausted our reserves under our tract the field will be completely depleted.

Q. Doesn't that chart or schedule that you submitted to the Court assume that all of the wells in the field will go out of production at the same time, that the whole field will go out of production at the same time?

A. No, sir, it doesn't assume that. The only thing it assumes is that the rate of withdrawal from my lease will be the same hereafter as it is now, and the rate of withdrawals from the field will be the same.

Q. That won't be true as to the whole field. Won't there be a lot of wells shut in around the edges of the field before your wells are shut down, and won't your wells operate for a much longer period than nearly any other area in the field?

A. I don't think so, more than any other area in the field. Of course, there are some wells on the west that are going to go to water and be abandoned.

Q. At the present time, Mr. Rowan, you know it to be a fact, don't you, that wells are being abandoned on the west and east side and northern and southern edges?

A. I think on the northern and southern and west wells are being abandoned, and I think, possibly, on the east side a few wells drilled on the extreme eastern limits in, you might say, a kind of sandy section in there. I don't know of any wells that have been abandoned on the east side that have had as much as ten feet of sand to begin with. Possibly they have.

Q. Isn't there a large area on the eastern side that is already on the pump?

A. Yes, sir.

Q. And isn't it true that the sands on that side
128 of the field are tight so that the east side of the field will go out of production a long time before the wells in the center of the field around your tract will go out of production?

A. No, sir, I don't think so, if your bottom hole pressures are holding like they are now. I think in that particular Gladewater area if what you have indicated is true, I believe that those wells on the east will be flowing as long as mine.

Q. You don't think the contrary is indicated by the fact that there are so many pumping wells on the east and the pressure on the east is so low at this time?

A. I say there are some pumping wells on the extreme eastern edge, but I don't know whether those wells are in an area where you have good sand, something like ten feet of good sand. There are wells drilled on the extreme east edge that don't have very much sand, and I think those wells have gone on the pump.

Q. Now, Mr. Rowan, you testified about Mr. Wood getting a permit. You protested against that permit, did you not?

A. Yes, sir.

Q. And carried it through the Courts and the Courts upheld Mr. Wood's permit, did they not?

A. Yes, sir.

Q. When you made—

A. They upheld the Railroad Commission to grant it. I guess that is upholding his permit.

Q. I didn't quite understand you.

A. I say they upheld the right of the Railroad Commission to grant the permit. I guess that is up-
129 holding his permit.

Q. When you protested the granting of the permit, you, at that time, through your counsel, threatened the Commission that you would file a suit of this kind, did you not?

A. I don't know whether I did or not.

Q. Let me read you—Mr. Tilley was representing you at that time, wasn't he?

A. Yes, sir.

Q. Let me read you part of his letter, "if the permit is granted this protestant will unquestionably litigate this question and again start litigation which will help no one, but will create confusion and probably result in injurious consequences to independent operators who, like the applicant, have drilled wells in good faith and have not subdivided." That is what your counsel wrote the Commission at the time he was protesting the granting of the Wood permit?

A. I don't know. I haven't seen that letter.

Q. Would you like to see it (passing paper to witness).

Mr. Tilley:

May I read the letter with him, Your Honor?

The Court:

Yes.

A. Well, it isn't signed. I don't know whether Mr. Tilley wrote it or not. He is here, and he can say whether he wrote or not. I never saw the letter, I can say that positively.

Mr. Tilley:

It sounds mighty like I wrote it, Mr. Hart. I am willing to admit it.

Mr. Hart:

We offer in evidence the letter, offering the last sentence in the last paragraph of that letter.

130 Mr. Tilley:

We object to that, if the Court please, because I think the letter is immaterial and irrelevant.

The Court:

Sustain the objection.

Mr. Hart:

If the Court please, I offer the letter for the purpose of showing that the purpose of the suit as brought by Mr. Rowan is not in order to attack the proration order, but is because he was peeved at the Commission for granting the permit to Mr. Wood on an adjoining tract.

The Court:

He says he doesn't know anything about it, he didn't write the letter. There is no information in there that he furnished to Mr. Tilley, apparently, that would bind him in any way.

Mr. Hart:

It is a part of the record before the Commission.

The Court:

That doesn't have any probative force at all in this case.

Mr. Hart:

Note the exception.

The Court:

We have a lot to try out without trying out those kind of things.

Re-Direct Examination.

Questions by Mr. Tilley:

Q. Mr. Rowan, does it make any difference how much oil you have under your land if you can't recover that ratably?

A. I don't just exactly understand that, Mr. Tilley.

Q. Well, for instance, Mr. Rowan, suppose you have the same amount of oil now that you had originally, but the Railroad Commission would shut in all
131 of your wells. Now, they would say, "Mr. Rowan, you have that much oil, but we are going to let you produce that ten years from now."

A. No; I would be in worse shape than I am in now.

Q. All right, under open flow conditions what would be your advantage with reference to the time of production of your oil?

A. The advantage would be with my wells in the middle of the field, the Fairway.

Q. You would have every advantage, then?

A. Yes, sir.

Q. Then, if the Railroad Commission delays you in the production of your oil, then the time element constitutes confiscation of your property?

A. Yes, sir.

Q. All right. Now, if under the present plan of production, Mr. Rowan, you can not get that proportion of the oil which is equivalent to that under your land before the water gets you or before all the reserves are gone; then in that way will you suffer confiscation or not?

The Court:

Counsel, it seems to me that your question is leading.

Mr. Tilley:

Rather, Judge. I withdraw it.

Q. Mr. Rowan, does it make any difference about how many wells you have over there on your tract or on the tract next to you as to how much oil underlays your tract? For instance, take an area of eight times the area of your lease and close in every well on those adjoining
132 leases except one to each twenty acre tract or each ten acre tract, what would be the effect of the recovery of your oil if there were drilled outside of that area which is eight times the area of your lease wells to a great density?

A. I think I would suffer drainage.

Q. Then, the question as to the density of the adjacent leases to you bears no reasonable relation to your recovery under your lease?

A. No, sir.

Q. Mr. Hart asked you whether or not you have changed your position about whether or not you contended back there in 1931 and 1932 that you wanted to drill more wells so you could recover more oil: What was your contention at that time?

A. Well, I have always had the same contention, so far as I knew.

Q. What was it?

A. That is, that I was entitled to recover the equivalent of the amount of oil that I had under my leases.

Q. Now, I read you from the same application filed by your attorney, which does not bear your signature, of October 8th, 1932—does it bear your signature?

A. No, sir.

Mr. Hart:

If the Court is going to rule that none of that is admissible—

The Court:

I don't see that it has anything to do with the case.

Mr. Moody:

Do you withdraw your offer?

133 Mr. Hart:

I don't withdraw anything.

Mr. Tilley:

He interrogated him without my objection on this other statement. Now, in explaining his statement in that instrument—

The Court:

Is it that letter which you are supposed to have written?

Mr. Tilley:

No; this is the application which was filed for more permits, in October, 1932, and which Mr. Hart called the attention of the witness to the fact that he was asking, his counsel was asking for more wells because he would be entitled to recover more oil. I now propose to show—and then he asked him if he has changed his position, I now propose to ask him whether or not in that same application, whoever wrote this application on behalf of him, didn't also say "and that we will thereby be assured of the oil underlying our leases at this time."

Mr. Hart:

If the Court please, both of these are in the form of briefs, the arguments that were submitted by counsel representing Mr. Rowan in those various cases.

The Court:

I think we made a mistake to ever let them get in evidence. I don't think it has anything to do with the case.

Mr. Tilley:

I think so, but, since he has injected it, I wanted to make that explanation.

The Court:

Two wrongs don't make a right.

Mr. Tilley:

I will refrain or desist right now, Your Honor.

134 Q. Now, have you seen a sand map of the Railroad Commission's? Does it have a sand contour map?

A. I understand they have a sand contour map.

Q. Well, have you been to proration hearings and seen that map?

A. I don't remember of ever seeing one at a proration hearing, although one might have been exhibited.

Q. Do you know Mr. J. S. Hudnall over here, a witness for the Railroad Commission?

A. Yes, sir.

Q. Have you seen his sand thickness map?

A. Yes, sir.

Q. Have you ever heard anyone seriously question the accuracy of that sand thickness map?

A. No, sir.

Q. Do you know whether or not practically every major oil company in Texas has such a map?

A. I think they do. I haven't seen them. They usually make them up on the field.

The Court:

Counsel, this evidence isn't worth anything.

Mr. Mahon:

Your Honor, we object to this witness being allowed to testify further, and ask that his previous testimony in

which he admits hearsay be stricken. He says he doesn't know. His testimony couldn't serve any useful purpose.

Mr. Tilley:

We withdraw it.

Mr. Hart:

Will the Court pass on the motion just made to strike his testimony?

The Court:

No, I am not going to strike it.

135 Mr. Hart:

Note the exception.

Q. Now, Mr. Hart in interrogating you interrogated you in regard to variations in sand thickness maps that would be prepared. Mr. Rowan, I will ask you whether or not there were variations on the potential map that the Railroad Commission took?

A. Yes, sir, there is variations on it.

Q. All right, do you know whether or not when they get such variations they consider those potentials, whether they considered them or threw them out?

A. They have thrown out certain potentials, yes, sir.

Q. Now, would the variations with reference to sand thickness be any more pronounced than they were with reference to potentials, the way the Railroad Commission took them?

A. I don't think it would be so pronounced.

Q. Mr. Hart asked you this morning as to whether or not you had appeared recently, Mr. Rowan, before the Railroad Commission, or within the last few years, to protest the present plan of proration and ask that the Commission adjust the allowables over there or promulgate a plan based on recoverable reserves under each

man's lease. Will you testify more fully in reference to that, and testify whether or not others have done the same thing for the last few years?

A. I appeared at two special hearings on my own application for an adjustment this past year, in 1938, and then I appeared at two statewide hearings.

Q. I am talking about since the rendition of the opinion in Brown versus Humble?

A. Yes, sir, I have appeared before the Railroad Commission.

Q. Who was there also and spoke to the Railroad Commission and protested?

A. Who spoke to the Railroad Commission and protested?

Q. Yes.

The Court:

Counsel, what has that to do with it?

Mr. Tilley:

Well, if the Court please, he has just by implication tried to impeach the testimony of this witness.

The Court:

What difference does that make who was there?

Mr. Tilley:

It shows that if they think he wasn't telling the truth he can be called to the stand.

The Court:

~~You haven't a jury here.~~ The Court is interested in this order, not all this crimination and recrimination.

Q. Mr. Rowan, you testified that your estimates of the recoverable oil under your lease have changed somewhat now from what they were originally. Can you

testify as to whether or not quite a large number of competent engineers have also likewise changed their opinions and estimates?

A. I think so, yes, sir, in the past few years we have given the field a higher recovery, and I think the Railroad Commission itself has even done that.

Q. Mr. Hart interrogated you about whether or not these wells have paid themselves out. Has Mr. Wood's well produced enough oil under his allowable to
137 have already paid out that well?

A. I don't know how much oil he has produced. His allowable has been; if he has produced it every day according to the schedule, it has been practically enough to pay the well out.

Q. Has he already produced as much oil as was originally under his lease? 8

A. Assuming he has a tenth of an acre, I think he has, yes, sir.

Q. He has?

A. I think so.

Mr. Hart:

We object to that. There is no evidence to show he had a tenth of an acre, and the permit gives him a well on an acre tract.

Mr. Moody:

Your Honor, let's straighten that out. I was in that business from the time it started. Mr. Wood comes to the Railroad Commission and applies for a permit on a one acre tract of land, or what he represents to be a one acre tract of land. The Railroad Commission can't try the title or get into a controversy over the number of acres in the tract. It is his representation that he has a one acre tract of land, but I think Mr. Hart does the record in that case an injustice to say it is an acre, or that we may do it an injustice to say it was a tenth. It was merely represented

to the Railroad Commission as an acre, and it is a matter that is not inquired into.

138 The Court:
 What is the materiality of it?

Mr. Moody:
 I don't think there is anything material about it.

The Court:
 Why take the time?

Mr. Moody:
 It just keeps going in here that it is an acre tract.

Mr. Tilley:
 And there is another thing I don't think is material. I don't want to go into that. And that is this question as to what Mr. Rowan said was the minimum allowable that should be given under his plan.

The Court:
 Why don't you all finish with this witness? If you go into all that Mr. Hart will have to examine him on it.

Mr. Tilley:
 Not if I ask him on the same matter Mr. Hart examined him on. I think it purely argumentative.

139 (Witness Excused).

E. O. BUCK, a witness for Complainant, having been first duly sworn, testified as follows:

Direct Examination.

Questions by Mr. Moody:

Q. State your name, please, sir.

A. E. O. Buck, B-u-c-k.

Q. Where do you live, Mr. Buck?

A. Houston, Texas.

Q. What is your business?

A. I am a consulting petroleum engineer and geologist.

Q. Mr. Buck, please state, sir, your education and training?

A. I am a graduate from Texas A. & M. College, class of 1926, with a major degree in geology and a minor in petroleum engineering.

Q. Mr. Buck, after you graduated from college, did you start at once into the petroleum engineering work?

A. It was more of the geological phase, Mr. Moody. I was employed by the Gulf Petroleum Company, or Gulf Production Company, as geologist and transferred to the Laredo district. I worked in that area from the summer of 1926 until February of 1927 when I was transferred to the Ft. Worth division and continued on in that capacity as geologist until the fall of 1928, and was then transferred to the Yates Pool in Pecos County; from there to the Wink field in Winkler County, and then to the Panhandle. I severed my relationship with the Gulf Company in the summer of 1931. And during the time that I was spending in all of those oil fields I was in the capacity of a petroleum engineer.

Q. Now, you started out working for them in geological work and finally got into petroleum engineering work?

A. That is correct.

Q. Now when you left the Gulf Company in
140 July, you say, 1931?

A. Yes, sir.

Q. For whom did you then go to work?

A. I went to work for the Atlantic Pipeline and surveyed a pipeline from Beaumont to Kilgore, Texas.

Q. How long were you with the Atlantic Pipeline Company?

A. From somewhere around the 1st of July until August 17, 1931.

Q. Then whom did you go to work for?

A. Well, I wasn't employed at that time, and the martial law was on in the East Texas Field, and so I took off for a couple of weeks and went back to the field and went to work for the railroad commission.

Q. When did you go to work for the railroad commission?

A. September 19, 1931.

Q. What work and what field or fields were you assigned to by the railroad commission?

A. I was petroleum engineer for the railroad commission in the East Texas Field, and after about March of 1932 I was promoted to resident engineer, which job I held until I left the commission in April of 1933.

Q. That is, you were resident engineer in the East Texas Field?

A. Yes, sir, in charge of the engineering department.

Q. Did you work under Mr. Dennie Parker here who was then supervisor of the Oil and Gas Division of the railroad commission.

A. Yes, sir.

Q. Now, Mr. Buck, since you left the employment of the railroad commission have you been in the private practice as a consulting engineer or have you been working for some of the oil companies?

141 A. When I first left the railroad commission, in April 1933, I took a job as technical advisor for the Conroe Operators Association and advised with them on the development and operation of the Conroe field. I held that position until the summer of 1935, and asked them then for an opportunity to devote part of my time to

a consulting practice, which they granted. And in the summer of 1936 I left their employment entirely, and since that time have devoted my entire time to the consulting practice.

Q. And maintaining your home in Houston?

A. Yes, sir.

Q. And office?

A. Yes, sir.

Q. Now, beginning—what is your first contact, then, with the East Texas oil field? Was it in September, 1932?

A. No, sir.

Q. September, 1931?

A. No, sir. As I explained, I surveyed this pipe line from Beaumont up to Kilgore and that was between July and August, 1931. At that same time, just prior to the martial law shut down, why, we were running in a lot of gravity pipe lines and so forth in the field along there tying in with the main lines. So I was generally familiar with the conditions there in the field prior to going to work for the railroad commission.

Q. But from September, 1931, to April, 1933, you were continuously in that oil field as an employee, as a petroleum engineer employed by the Railroad Commission of Texas?

A. That is correct.

142 Q. Did your duties require you to devote all of your attention to some particular part of the field or did your duties involve bringing you in contact with all parts of the East Texas field as it was then in the process of development?

A. The duties of my office, Mr. Moody, were to make a general study of the field. As you recall, the railroad commission had very few regulations when they took over the field in 1931. In September they took over the duties of administering the regulation of that field from an oil proration group which was called the Texas Central Proration Committee, I believe something like

that, and the railroad commission had very few, if any, rules and regulations. And our first duties upon going in there in September of 1931 was to study the field and write such rules and regulations as would call for an orderly development and proper completion of the wells in the field, and particularly with the spacing of the wells in that field. The first assignment that I had in the East Texas oil field was to unitize that field on twenty acre units and fractions thereof for spacing of the wells in the East Texas field.

Q. Was that the first drilling plan that the railroad commission had in the East Texas field? That is, after they went to undertaking to handle it was to drill it in twenty acre units and allow each fellow a well on every twenty acre unit or fraction thereof?

A. Yes, sir.

Q. Was that later changed by changing Rule 37?

A. Here is what happened in there, the old Central Proration Committee had adopted a twenty acre spacing also, but they permitted ten acre locations. In
143 other words, you cut your tract into a twenty acre tract, but they gave you a 336.60 location, which is in effect a ten-acre spacing. The railroad commission continued with that and there was quite a bit of controversy about it, and they changed that and went back to 150-300 foot location for awhile. I believe it was later proved that there was a period in there that they didn't have any spacing rule and then when that was called to their attention, why, they got that straightened out and they went back on ten acre spacing, as I recall, and that rule is still in effect.

Q. Do you recall how many wells there were in the East Texas field when you first went there?

A. Yes, sir, when I was there—I don't know when I first went there, but I know at the time of the martial law shut down, August 17, 1931, there were approximately 1,765 wells in the East Texas oil field.

Q. Do you remember approximately how many wells there were in the East Texas oil field when you severed your connection with the railroad commission, a matter of a year and seven months later, I guess. April of 1933, is that it?

A. Yes, sir.

Q. Do you remember how many there were then?

A. Roughly twelve thousand wells; right in the neighborhood of twelve thousand wells.

Q. Now, in the time you were in that field as employee of the railroad commission did you examine many or few well logs?

A. Mr. Moody, when I first went there and we got the unitized twenty acre spacing map made, the next important problem over there was to try to determine the water level in that field.

144 The Court:

You are not answering his questions. We can get along so much faster if you will listen to what he asks you. He asked you if you had examined many or few well logs. You can answer that "many" or "few".

A. Yes, sir, I did.

Q. Many of them, what?

A. Many of them.

Q. Now, what duties did you perform, if any, with reference to locating the water table in that field?

A. We passed a rule at that time in the East Texas field that a well could not penetrate into the sand deeper than two-thirds of the sand thickness above the water table, and the operators immediately came back and said "Where is the water table?" So the onus was then on the commission to try to establish this, and I spent a considerable amount of time with my associates working with the drilling wells up and down the west side of the field, examining the cores and drillers' logs and all of the

company records that were available to me in determining what this original water table was so we would have a penetration factor we could give the operators that were drilling in that western side of the field.

Q. All right. Now, then, did the performance of that particular work make it necessary that you study well logs and well cores?

A. Yes, sir.

Q. Did you study many of the well cores?

A. Yes, sir.

Q. Many?

145 A. Yes, sir, I studied every core that was made available to me, and I am sure that by the summer of 1932 that I had examined over 500 individual cores—I mean cores from 500 individual wells in that field.

Q. Were they just from one part of the field or did the cores involved take in all parts of the field?

A. All parts of the field.

Q. Now, at the time you left the commission in 1933 had the field, the general confines of that field been located? I mean the general limit of it, had they been drilled over, had it been drilled over as far east and out west as far as it runs and north and south? Had they found the thing we know now as four or five miles wide and thirty or forty miles long?

A. Yes, sir, the field had been delimited on all sides.

Q. All right. While you were with the railroad commission, and in connection with your efforts to learn the original water table there, had that study involved any study of the sand thickness in that field?

A. Yes, sir.

Q. Had you made such studies?

A. Yes, sir.

Q. Now, since you left the railroad commission and since you have been in the private practice as a consulting petroleum engineer have your employments called upon you to continue your studies or make further studies of the East Texas field?

A. Yes, sir, I have been back to the East Texas field on occasions no less than four times every year
146 since I have left there, and in some years more often than that in going back making a study, either appraisal of properties or other matters as to value of properties.

Q. And you have been called on at various times to testify before the railroad commission or Courts or tax commissions with respect to the properties and conditions of the East Texas field?

A. Yes, sir. For a period there after I left the commission every time I got back to Austin someone put me on the witness stand to testify about the East Texas oil field.

Q. Now, Mr. Buck, you have been employed in this case by Rowan & Nichols, the Plaintiff?

A. Yes, sir.

Q. You have been employed as an expert witness?

A. Well, I wouldn't say that I am an expert—

Q. You have been employed as an engineer, I will put it that way?

A. Yes, sir.

Q. And you are here under their employment?

A. Yes, sir.

Q. Now, Mr. Buck, in connection with the problem that is presented by this case, have you in addition to the information that you have accumulated back through the years concerning the East Texas oil field, have you made further studies into the East Texas field?

A. I have.

Q. Have you, as the field has been developed and the railroad commission has been in the business of prorating the field, have you from time to time kept an
147 account of and informed yourself on the various methods that the railroad commission has adopted in prorating the East Texas field?

A. Yes, sir, I have kept up with that and have attempted to read every publication or recognized authority on conditions in the field.

Q. Now, Mr. Buck, it is my understanding that the present proration plan in the East Texas field is substantially this; that a field allowable of some 520,000—

Mr. Hart:

If the Court please, we wish to object to counsel stating his understanding of that. If they want to prove up the proration scheme they can introduce it.

The Court:

"I would like to hear him state it. Of course, the order itself is what finally controls, but I would like to hear his statement of it. Go ahead.

Q. As I understand—

The Court:

You are not bound by his statement.

Mr. Moody:

No, sir.

Mr. Hart:

I object to it being in evidence and being binding on us.

The Court:

The order itself controls.

Q. As I understand, the present proration plan involves a field allowable of approximately 522,000 barrels of oil per day. That is the allowable production allotted to the field. The commission then allows to all wells that will make twenty barrels or less than twenty barrels—allows to all wells twenty barrels of oil per well. Some of the wells will not make twenty barrels, and the difference

between what they can make and the twenty barrels is then allotted on a basis of well potentials to wells in the field that can make more than twenty barrels and that the potential basis or the potential factor that they use in the plan of proration is arrived at by periodically taking well potentials under controlled conditions in certain key wells throughout the field, perhaps some 100 or so wells, and then in that manner they allocate the 522,000 barrels of allowable oil from the field amongst the several wells in the field, and the 522,000 barrels, as I understand, is a figure that is determined upon the basis of market demand and also what quantity can be produced without reducing the bottom hole pressure to that point which will result in the creation of physical waste. I have stated my understanding of it. I will ask you if that is not a correct statement of it, and if not, indicate wherein it is incorrect and make a correct statement of the plan.

A. That is substantially correct. The plan, the original potential tests were taken in April of 1933, and at that time, as I recall, some seventy-five key wells were taken. The total top allowable for the field, was placed or determined by the commission and then an allowance for marginal wells, or as they call any well that could not be produced below twenty barrels, if it was capable of producing that many, was divided into the total potential as taken by the railroad commission in potential tests of these wells and a factor was determined then—the way this thing works out they give every well that is capable of making it twenty barrels and then they multiply that well's potential factor and in that way increase the allowable on some of the wells up to as high as twenty-five barrels. If a well can't make more on a potential test than 800 barrels an hour it receives the same twenty barrels as one that is a twenty barrel pumper, but if the well is capable of producing above 800 barrels a well and up to the top potential of

1,100 barrels per hour then the distribution is made. It works virtually to this effect, that 97% of the allowable is distributed on a per well basis and 3% of the allowable is allocated among the wells that are capable of producing above 800 barrels an hour. That is virtually what the order does.

Q. Well, now, you heard some figure here of two decimal some odd per cent of the well potential. How does that—how is that figure used in allocating the allowable production amongst the wells?

A. I don't know if this is an exact statement of it or not because I haven't checked those figures in some time, but usually they take the hourly potential of the well, and its portion of the hourly potential of the field, and they determine this potential factor and then they give the well its twenty barrels and multiply that potential factor by what is remaining there to distribute. You see, as more wells come in naturally that spread between the thousand barrel well and 800 barrel well is decreased. At one time it was more than five barrels. Now the spread is five barrels, or approximately five barrels.

Q. Well, now, under this present plan of proration is every well that is incapable of making more than twenty barrels of oil per day allowed that quantity of oil which it can make up to the twenty barrels? Let me state that question again: does the present plan allow to every well that cannot make more than twenty barrels per day, does it allow to such well twenty barrels if it can make it or whatever under twenty it can make?

A. Yes, sir, whatever the well will pump. They usually give it a several day pumping test and whatever it will make, and average over several days period, that is the average up to twenty barrels.

Q. Now, how many wells are there—the railroad commission puts out, does it not, a schedule that they call

the proration schedule, in which they list all of the wells in the field and all of the—

Mr. Moody:

Your Honor, I am not going to introduce this in evidence, there is too much of it, but so the idea may be before the Court, the railroad commission monthly puts out a thing of this kind that gives the names of the wells and the leases and the amount of oil allowed to each particular well, is that right?

A. Yes, sir, this schedule—

Q. Proration schedule—

A. Shows the company, the lease, survey and county in which the well is located, and the number of the well and its potential, and then in either the front or the back of the schedule they have a key system that you can look up the potential that is shown out beside the well and see what your allowable would be.

Q. All right. Now, then, have you made a study of this last proration schedule issued by the railroad commission?

A. Yes, sir.

Q. How many wells in that field, as reflected by that last proration schedule promulgated by the commission—first, I will ask you when was this last schedule promulgated?

A. The last schedule that I have seen is as of January 1, 1939.

151 Q. All right. Now, then, how many wells are shown by that schedule to be in that field at this time that will not make twenty barrels of oil per day?

A. I believe it is 468 wells.

Q. Those 468 wells, do you know how much oil they actually produce?

A. It is somewhere above 5,000 barrels. I don't know just exactly what the figure is. I didn't finish my calculations on it. It was furnished to me but I don't remember it.

Q. All right. Now, then, the wells that can produce more than twenty barrels of oil per day are started off, as I understand, with twenty barrels?

A. Yes, sir.

Q. All right. Now, then, there are 25,900 producing wells in that field at this time, are there not?

A. My last check on it was 25,910 wells.

Q. All right, at twenty barrels per well, 25,900, would be 518,000, wouldn't it?

A. Yes, sir.

Q. Then, that leaves 4,000 barrels of oil, plus whatever this 468 will lack of making twenty barrels apiece, to be prorated amongst the wells on the potential factor, is that right?

A. Yes, sir.

Q. Do you know how many barrels of the total 522,000 daily allowable to the field is prorated on the potential factor?

A. Slightly less than 14,000 barrels.

Q. What per cent of the daily allowable of the field is allocated to wells upon the basis of the potential factor that the commission determines by taking the potential of these key wells?

A. Between two and a half and three per cent.

Q. That would mean, then, between ninety-
152 seven and ninety-seven and a half is allocated on a per well basis?

A. That is correct.

Q. Now, is that the practical application of the present order that the commission is enforcing in the East Texas field?

A. Yes, sir, that is the way it is being enforced.

Q. Now, does that order take into account or does either the order in its terms, and we will introduce that order, your Honor, does the order in its terms or does the application of the order in the East Texas field take into account the acreage in any lease, and I mean surface area when I say acreage?

A. No, sir, it does not.

Q. Does that proration order or plan take into account any question of oil reserves under any particular lease?

A. It does not.

Q. All right. Now, in the practical working of that order, assuming that—well, I will ask it this way: do you know of any instance in the East Texas field where one tract of land drilled to a density of one well to say five acres and an adjoining tract of land is drilled to a density of one well to one acre, do you know of any such instances as that?

A. Yes, sir, I think you can find on the maps many instances like that.

Q. Many instances. Now, then, assuming that the Wood tract here has an area of one acre—that is the figure Mr. Hart has been using—then the tract we have been talking about here in the case, the Rowan & Nichols tract, does that furnish just such an example?

A. Yes, sir.

Q. You know of other examples?

153. A. Yes, sir. Remember, since the last time I checked it there have been additional wells drilled on the tract. That would change that. But I have seen numerous examples of that.

Q. Now, then, assuming that the Wood well and the Rowan & Nichols wells had been drilled with the same size bit and to the same depth in the sand and had been completed in the same manner and used the same sort of equipment in completing the wells drilled right there together, would you—is your experience in the East Texas oil field such that you would be able to give us an opinion as to whether or not the two tracts would likely have the same potential, the Wood well and one off setting it, would likely have the same potential?

A. Yes, they would have practically the same potential under the conditions you have demonstrated.

Q. Now, then, let's assume that they do have the same potentials. As this order is now being enforced in the East Texas oil field, what amount of oil is the plaintiff in this case, Rowan & Nichols, allowed to produce daily per acre off their lease, and what amount of oil is Mr. Wood allowed to produce daily, per acre, off his lease?

A. I believe in figures Mr. Rowan recovers slightly in excess of four barrels per acre per day and Mr. Wood would recover or be allowed to produce slightly in excess of twenty-two barrels per acre per day under the conditions that you have given me.

Q. In other words, the production on the small tract would be roughly 500% when you translate it into production per acre?

A. Yes, sir.

Q. 500 per cent of what the Rowan & Nichols
154 tract is allowed to produce?

A. Yes, sir.

Q. Now, in the application of such an order as the one now being enforced by the railroad commission, is what has been shown by this illustration, is that true in many places in the field?

A. Yes, that is true all over the field where there is any difference in the spacing of any one well as compared to another within the same contour line.

Q. You know of wells over there being drilled on considerably less than half an acre, do you not?

A. Yes, sir.

Q. Now, then, such a well producing, if it could produce more than twenty barrels per day, that is, if it can get the benefit of a part of this three per cent that is allocated to potential, and if it is offsetting another tract of land that is drilled to a density of one well to ten acres, then the well—the well on the tenth of an acre tract will produce approximately a hundred times as much per acre per day as the well that is drilled on the ten acre tract, will it not?

A. That is correct.

Q. Is there anything in the order that undertakes to take into consideration the fact that one man owning a tenth of an acre here or a half of an acre here, and owning that from the center of the earth to the dome of the heavens and adjoining a man who owned a tract say of five acres with one well on it, and owning from the center of the earth to the dome of the heavens, is there anything in the order that attempts to make any adjustment between this man with one well on five
155 acres and the adjoining man on a half acre or tenth of an acre?

A. The only adjustment that is made there would be that slight adjustment if the two tracts had different potential values.

Q. All right.

A. As far as the reserve is concerned or what he might own under his land, there is no attempt in this order to satisfy one land owner against another.

Q. All right. Now, I will go into that later on, into the question as to how much of a test this potential factor is, but now I will ask you this question: in your opinion, where one man has a tract of five acres or a tract of five acres with one well drilled on it, and the adjoining man has a tract of a tenth of an acre or half an acre with one well drilled on it—

A. Yes, sir.

Q. Would the difference that might exist in potentials between those wells take account of the fact that one man had so many more times as much surface and so many times more area in his sands, would the potential factor take, adjust that thing so that each one would be under this order allowed to produce his proportionate part of the oil in place?

A. No, sir, it would not, and the order never attempted that, has never attempted that.

Q. Now, I asked you if this order took into account surface acreage and you said it did not. Does it take into account sand thickness under a lease?

A. No, sir.

Q. Now, let's get to this question of potentials. I want you to describe to the Court how those potentials
156 are taken. By the way, do you have one of those potential maps of the railroad commission here with you?

A. No, sir. I have asked for one and we had one borrowed, but I haven't seen it.

Q. I want you to describe to the Court how these potentials are taken and about the key wells and how these contour lines are run and how it is determined, how the commission attempts to determine by taking these potentials of a few wells the potentials of 25,000 wells.

A. The first potential test that was made in the East Texas field was made in April of 1933. After I had left the commission the commission borrowed me back from the people that I was working for to come back there and assist in the selection of these wells and the starting of the potential order. At that time, if I remember correctly, we picked some sixty-seven wells to start a potential test on, and we naturally picked key wells right down the center of the oil field. We did that for several reasons. One was we knew we could produce those wells at open capacity without any apparent damage to the wells or the surrounding property if we didn't do that over too long a period of time. So we were very careful as to their location as key wells. Also, it was necessary to select wells that had sufficient sized casings in them to produce this quantity of oil. It was also necessary that the wells be equipped with large flow lines, and that the tanks were located in close proximity to the well that we were testing. As I recall, we tested first sixty-three wells scattered up and down and as near as possible right down the center of the oil field. And out of that sixty-

157 seven or sixty-eight wells there were three or four of them that something went wrong. They would have maybe a nine hundred or thousand barrel potential area there and there would be a well in the middle of it only producing 600 barrels, so I never at any time since the beginning of potentials thought anything of them as a measure of anything except the amount of oil that a well might produce. So we would throw these wells out and hunt around in that neighborhood there until we could find another one that would come up to somewhere where we expected it to produce. I think on the first test that was completed we had seventy-five or seventy-six wells taken as key wells for the potentials. We then contoured the field on lines of equal pressure, I mean equal production, or made a potential contour map. Naturally, as we had avoided—we avoided getting too close to the west edge of the field because sudden, rapid production of a well over there might cause it to produce water. It was necessary then to even space our contour from our last point of control over to the western edge, and as we were contouring in hundred barrel contours, we just equal spaced it. If we were a mile from the west edge we divided that mile into five equal parts and we stepped down from a potential of 500 barrels an hour to zero barrels just in even steps, and likewise that same condition was done on the east side of the field. We were not afraid of bringing into the wells water. Most of the wells on the east side were either small wells or pumping wells or equipped with small flow lines. You couldn't get the operators, they weren't willing to put their wells up as saying they would be representative of that territory in there, so likewise on the east side of the field from our last point of control, anywhere from a half

158 to three-quarters to a mile from the eastern extremity of the field we also even spaced the contour in there, so by throwing out what freak wells that we couldn't account for we finally made the first potential

map. There was a loud howl and protest and complaint and any number of operators said their wells were better than that, and one or two wells that were drilling at the time that this potential order was put in specifically completed their wells so they would make a high potential, and the commission granted them an opportunity to produce a potential test. So they have added to this thing now, and as I understand there is in excess of a hundred wells now that are on this potential schedule. Some of them were taken during the shut down period of the first two weeks of April of 1933 and some of them were taken after the field had been opened up and was producing again, but those potential wells after they were established and accepted, all wells that fall in that contour line fall within the potential range as set out by the railroad commission unless the operator protests, and if he does they let him go out and take a potential test.

Q. Well, now, do you think that that system of testing a few wells and undertaking to draw contour lines from them is an accurate way of classifying wells in that field with respect to the potential of the well?

A. Well, in respect to the potential of a well, naturally the more wells that you would take potential tests on, why, the more nearly you would approach the true potential condition of your field, whatever the potential means. I have never satisfied my mind that the potential is representative of anything except possibly a slight indication of the permeability of a sand and the mechanical efficiency of a well to produce oil.

159

Q. All right. Now, that leads to this question: what is, in your opinion, or what will be indicated by a potential test and what will have to do, what will determine whether that potential is high or low, please, sir?

A. The two or three factors that control whether that potential would be high or low would be the permeability of the sand, the mechanical condition in which the well is completed, such as the size of the casing and the flow

lines, the close proximity of the tank, the amount of back pressure that the well was flowed on or the mechanical hook-up of the well plus the reservoir pressure at the well.

Q. That is, if I understand you right, it is permeability and the mechanical equipment of the well—

A. Yes, sir.

Q. Mechanical completion and equipment of the well—

A. Yes, sir.

Q. And pressure. Those things all have to do with the potential of the well?

A. Yes, sir.

Q. Now, then, does the potential tell you anything about—which is the best way to find out about the bottom hole pressure, by trying to take a potential or running a pressure bomb down in the well?

A. It is lots more positive, and cheaper too, to take the bottom hole pressure.

Q. All right, is the potential any fair test of bottom hole pressure or an accurate test?

A. No, because there are so many other factors
160 that could be influencing the production of that well other than pressure.

Q. So the only thing that a potential test will tell with respect to the formation from which the well is drilled is the permeability?

A. Yes. Of course, we have this factor—I made use of the word permeability there. You could have a varying permeability in there, but—and also a varying sand penetration, and get the same results. In other words, if you have less permeability and greater penetration or the other way around you would get the same results if the well was mechanically completed the same and the bottom hole pressure was the same. There are so many variable factors in there that I don't see how it could represent anything.

Q. How much would it cost to take the bottom hole pressure, approximately, if you know, in the East Texas field?

A. Well, there are services hired for that at \$100 a day, and a good operator can take anywhere from four to seven pressures a day.

Q. How much would it cost, approximately, to take the potential of a well in the East Texas oil field?

A. It just depends, Mr. Moody, on what the conditions are. Out of the 25,000 wells over there that they could take a potential on, we—at the time I was in there it was 12,000 wells that we wanted to take potentials on and we were having difficulties in selecting one hundred of them that were mechanically equipped to take potentials on. Now, some of the operators volunteered to go in and change their well hook-ups and rearrange their lease facilities to accommodate us for taking those tests, and the cost there on changing that could vary anywhere from \$100.00 to \$1000.00, depending on what they might have to do in changing the well hook-up.

The Court:

Counsel, what is the materiality of that?

Mr. Moody:

I don't think it is particularly material.

Q. Mr. Buck, will the potential tests of one well and an adjoining well be an accurate measure of the capacity of those two wells to produce unless both wells were drilled into the sand to the same depth and at the same bore and completed in identically the same manner, and unless the potential is taken under exactly the same circumstances with respect to equipment and back pressure maintained on the well during the time the test is taken?

A. The further stipulation that the pressure on the two wells be the same. Then the two potentials would reflect, otherwise they wouldn't.

Q. The relative capacity of the wells to produce?

A. Yes, sir.

Q. Are all wells in the East Texas field drilled in the same way, take in the same amount of sand, all drilled to the same size, all equipped in the same way and to the same depth of sand, or do they vary in those respects?

A. As a general it varies by operators. Each operator has an idea about how to complete a well, and as many operators as you have, you have that many different types of completion.

Q. Insofar as potentials are taken in the East Texas field, in your opinion, do those potentials do anything more than show the capacity of the particular well the potential is taken on to produce oil?

A. That is all it means to me.

Q. Does it have any relation to the capacity of a well a quarter of a mile from there or 300 yards from 162' there to produce oil?

A. I see no particular bearing it could have on anything.

Q. Now, you stated that the potential test might reflect something about permeability. I want you to explain to the Court about permeability—and since those terms are some times confused amongst us in our conversation, also explain to the Court the difference between permeability as you petroleum engineers discuss it and porosity as you use that term.

A. For a substance to have permeability it must necessarily have porosity, but it doesn't always follow—the two terms are not the same, and in some instances we have substances that have porosity but have no permeability. I might put it this way: if we divided this Court room with a partition into two equal halves. I can fill one-half of this Court room with basket balls and I can fill the other side of this Court room with number eight BB shots, and they would each have the same porosity, but the permeability of the room that had the basket balls in it would

be many, many times greater than the one that had the BB shots. The permeability is a measure of the ease, or the resistance, rather, resistance to flow of fluids or liquids or gases through a porous medium. Now, naturally, if you take a room that is full of basket balls and have this big space in between each ball it is very easy for the liquid in there to move from one big void space to another and get out, whereas in the other side of the room where it is full of BB shot, the movement of that liquid through there would be subject to many more frictional obstructions and the permeability of that would be far less than the permeability of the other room. So when

163 we speak of permeability we are talking about the ease with which something can pass through, and the porosity means the amount of void space or pore space or open spaces between the sand grains.

Q. All right. Now, in your illustration there if you divide this Court room into two halves and fill one end with basket balls and the other with BB shot or bird shot you say that the porosity would be the same?

A. Yes, sir.

Q. You mean by that that the voids in the room where the basket balls were would be just the same as the voids in the room that was filled with BB shot?

A. Yes, sir, the cubical content of the void space would be identical.

Q. That is on the theory that where you have round things of that kind, all of uniform size, that three-fourths of the space is taken up by the round things?

A. Yes, sir.

Q. And one-fourth of the space is not taken up, whether you use number eight bird shot, BB shot, or basket balls?

A. That one-fourth there as an approximation of twenty-five per cent porosity there.

Q. The relative spacing there is the same?

A. Identical.

Q. Where the openings are larger there you have the greater permeability though you may not have a greater porosity?

A. You have identical porosity, but considerable greater permeability.

Q. In your opinion does the potential factor tell anything or reflect anything about the porosity of the sand?

A. No, sir, it doesn't indicate anything about
164 the porosity at all.

Q. All right, does the porosity have anything to do with the amount of oil reserves in a particular acre foot of sand?

A. It has all to do with it.

Q. All right. Now, then, in your opinion the potential test doesn't tell anything about the porosity, though it may reflect something about the permeability?

A. That is correct.

Q. Now, in the matter of estimating oil reserves, what factors do you take into consideration, Mr. Buck?

A. In the estimation of oil reserves you are naturally concerned primarily with the cubical content of the property which you have under investigation, that is, the cubical content of the sand. That would concern the porosity and its per cent of saturation, what it is saturated with, the nature and type of the product that is saturated in there, the gravity of the oil, the amount of gas in the oil, the pressure of that formation and the physical aspects as to the nature of the force that moves the oil through the sand, whether it be water pressure or gas pressure or a combination of both, and the structural position of that particular property. Those factors would naturally have to be taken into effect before you could give an appraisal of the property.

Q. Now, taking in the East Texas Field, particularly in this area where the—I will change my question, please, Mr. Reporter. Taking the East Texas Field, have the studies been sufficient there to form what are regarded by

165 petroleum engineers and oil operators as accurate estimates of oil reserves?

A. Yes, sir, I think so.

Q. Now, then, with respect to that part of the field in which Mr. Foran—Mr. Rowan and Nichols' lease is located, is there information available from which estimates of oil reserves in that part of the field can be made, within that range that would be regarded by petroleum engineers and oil operators as accurate estimates?

A. Yes, sir.

Q. You say you would take into consideration the sand thickness?

A. Acre feet of sand.

Q. Acre feet of sand?

A. Yes, sir.

Q. That would mean the surface area? You would project that down and that would give you two dimensions, and then you would get thickness of sand that that would give you acre feet of sand?

A. Yes, sir.

Q. You would also have to know the porosity of the sand?

A. Yes, sir.

Q. You would have to know something about the pressure?

A. Yes, sir.

Q. You would have to know whether it was gas in solution, the viscosity of the oil?

A. Yes, sir, and you of course would want to know the—something about the permeability.

Q. Porosity and permeability?

A. That is correct.

166 Q. Now, then, have many or few cores been recovered—you testified about that—have tests been made on the cores recovered from the East Texas Field to determine something about the porosity obtaining in that field?

A. Yes, sir, many of them have.

Q. Do you know what is regarded as the average—if you had a core that was taken from that sand, the Woodbine Section thirty feet of it, where the sand is thirty feet thick, and another one where it was taken from the sand where it was sixty feet thick and another where it was ninety feet thick, do you know what studies have developed as to what would be the average porosity of the several cores?

A. Yes, sir, I have made estimates, what we call a weighted porosity determination of cores from information that has been made available to me, and other engineers studying this problem have also made similar determinations. We find that the average porosity over there is somewhere between twenty-four and twenty-six per cent. I use a factor of twenty-four.

Q. All right, does that make any difference whether you have a core where it is thirty feet thick or sixty feet thick?

A. No. You see, we have a porosity variance over there from around sixteen or eighteen per cent up to as high as thirty-three per cent, and you will find streaks of this tight, less porous sand and then streaks of the porous sand in the same well, so your average weighted variation will run very nearly to twenty-four per cent.

Q. Have they determined what is the average permeability in the East Texas Field?

167

A. We don't have as many permeability determinations as we have core determinations, but where we lack in permeability determinations from cores we can determine that from reservoir pressures, so we are equally as well fortified as to permeability determinations; although we don't have our measures in dorsi or millidorsies we have it in pounds of pressure.

Q. It is what is known as a water drive field, is it not?

A. Generally recognized, I believe, by most authorities.

Q. All right. Do you have in the East Texas Field—have investigations determined the top of the sand and the bottom of the sand so that you can determine the average range or average thickness of the sand under any lease in that field?

A. Yes, sir, I made a sand thickness map over there in December of 1932 with less than 10,000 wells to work with.

Q. Now, have pressure studies been made there so that the pressures obtaining in the various parts of the field are well known?

A. Yes, sir. I inaugurated the taking of those pressures and they have come right on down. The railroad commission has monthly pressure checks, plus the monthly pressure checks of the individuals over there. We have more pressure information on the East Texas Field than any other field in the world.

Q. Now, has it been determined in that field what pressure the gas now in solution will pass out of solution and leave the oil thicker and heavier?

A. Yes, sir, it has been actually determined. The Bureau of Mines has done some private work on
168 that and various bureaus of companies have worked on that problem, and it is generally recognized that the violent point is around 575 pounds.

Q. I believe that covers the various factors you said were to be taken into effect in determining oil reserves in the East Texas Field?

A. Yes, sir.

Q. Then, information is available from which oil reserves in that field can be determined?

A. Yes, sir.

Q. Is that information available to the Railroad Commission of Texas at this time?

A. I am sure that it is.

Q. Now, then, is there any method—is there any factor in the present plan of proration that makes allowance for

the recoverable oil between two tracts that are affected by this proration order?

A. No, sir.

The Court:

I didn't understand that question. Restate it, please.

Q. Is there any factor in the present proration order that makes allowance for the difference between the recoverable oil under two adjoining tracts that are affected by the proration order?

A. And I said "no."

Mr. Moody:

That is what I meant to state the first time.

The Court:

I understand.

169

Q. What is your answer?

A. I said "no."

(At this time a recess was taken until 9:30 a. m., February 7, 1939, at which time the following proceedings were had:)

Direct Examination (Resumed).

Questions by Mr. Moody:

Q. Mr. Buck: yesterday afternoon at the time Court recessed I had asked you, I believe, a question bearing upon whether or not the present plan of proration had any factors that took into account the difference between the oil reserves in two leases that might adjoin, and you had answered that question. Now, with respect to the plaintiff's lease involved in this case, a twenty-five acre tract of land, and in the pleadings there is also mentioned a tract

of land adjoining, referred to as the Wood tract. There is some controversy whether that tract is a one acre tract or one-tenth of an acre tract, apparently. Now, then, is there any factor in the existing plan of proration that is enforced in the East Texas Field that makes any allowance or takes into account in any way the difference between the oil reserves under the Rowan & Nichols twenty-five acre tract and the oil reserves under the Wood tract, whether it be one acre tract or one-tenth of an acre tract?

A. None whatsoever.

Q. Now, the Wood tract is drilled to a density either of one well to a tenth of an acre or one well to one acre, whichever it may be, and the Rowan & Nichols tract is drilled to a density of approximately one well to 170 five acres?

A. Yes, sir.

Q. Now, is there any factor in the existing proration order or in the application of it to the East Texas Oil Field, that takes into account the oil reserves, the respective oil reserves under these two tracts, so as to allow those tracts to produce oil in proportion to the recoverable oils under them, respectively?

A. No, sir.

Q. In your opinion is this order, as enforced, applied and enforced in the field, particularly with respect to the Rowan & Nichols tract and the Wood tract, are those tracts allowed to produce in proportion to their respective reserves?

A. They are not.

Q. Now, we have applied—the questions have now been directed to those two tracts. Through the field generally as the order is applied and enforced—does it take into account the difference between oil reserves in any tracts and allow production in proportion to reserves?

A. None that I know of. I don't believe that it does.

Q. Now, would it be possible to calculate what proportion of the total reserves in the field are under the Wood land?

A. Yes, sir, I believe so.

Q. Would it be possible to calculate what proportion of the total reserves of the field are under the Rowan & Nichols tract?

A. Yes, sir.

Q. So, throughout the field could petroleum engineers, with that degree of accuracy which would be regarded as accurate by engineers and oil operators calculate
171 the oil reserves under the various leases in the field?

A. Yes, sir.

Q. Now, have you made calculations on the oil reserves under the Rowan & Nichols tract of land?

A. Yes, sir.

Q. Does this order as it is applied and enforced in the field, and particularly with respect to the Rowan & Nichols tract of land, does this order allow production from the Rowan & Nichols tract of land in that proportion that the oil reserves under that tract—well, I will change the question. As the order is applied and enforced in the field, and particularly with respect to the Rowan & Nichols tract of land, is that tract of land allowed the same proportion of the daily allowable granted to the field by the commission that the reserves under the Rowan & Nichols tract bears to the total reserves in the East Texas Field?

A. It does not.

Q. Is the order as applied in the field—applied and enforced in the field, and particularly with respect to the Rowan & Nichols tract of land, does it allow the Rowan & Nichols tract of land to produce along with other tracts around it and away from it in that same proportion—well, I will change the question a little. As the order is enforced and applied in the field, and particularly with

respect to the Rowan & Nichols tract of land, is that tract allowed to produce in the same proportion to its reserves that other tracts in the field are allowed to produce, or is there a difference in the ratio of production in 172 different tracts as compared with the ratio of the reserves of one to the other?

A. There are in every instance differences—

Q. Recoverable reserves I am referring to.

A. In every instance there are differences, depending upon the structural position of the properties and the density of it. Some of the properties are producing less in proportion to their recoverable reserves than the Rowan & Nichols tract; in others they are producing considerable more.

Q. Does the order as it is applied and enforced in the field, and particularly with respect to the Rowan & Nichols tract of land, entitle the owners of leases there or give the owners of leases there an equal opportunity to realize upon the oil reserves, recoverable oil reserves, of their respective leases?

A. No, sir.

Q. Now, yesterday afternoon you stated certain factors that should be taken into consideration in figuring oil reserves, recoverable oil reserves. You stated a number, porosity, permeability, acre feet of sand, and quite a number of other factors. You said, I believe, that each of those were essential to calculating reserves?

A. That is correct.

Q. Will the potential factors, or a determination of the potential on a well or lease, take the place of all those other factors and give you an index to the recoverable reserves on a particular land upon which a potential of well or wells is taken?

A. It will not.

173 Q. Well, in appraising or valuing property for taxing purposes or sale or mortgage or any other purpose is it necessary to estimate recoverable reserves?

A. Yes, sir.

Mr. Hart:

We wish to object to that question as being immaterial and irrelevant to the issues in this case.

The Court:

What is the purpose of the evidence?

Mr. Moody:

The purpose of the evidence is, your Honor, and I don't want to transgress that ruling your Honor made yesterday, I don't want to even have the appearance of it, but the Courts have said up here—I tried to use a moment ago the language of the Courts with reference to equal opportunity, the lease owners being entitled to equal opportunity to produce, and I was undertaking to fortify the testimony that he has given by showing that oil reserves, the value of a lease is its oil reserves, and that there is no way to determine that, the value of a lease, by taking a potential on wells. That is what I had in mind.

The Court:

All right, overrule the objection.

Q. All right.

A. Governor Moody, in any appraisal or valuation estimation that I have ever made, or any engineer in this Court room ever made, they had to go in and consider the factors that I have given you yesterday afternoon, and there are none of us that would have in any way attempted to place a value on a piece of property solely by its potential.

Q. Now, you are talking about potentials as they are taken in the East Texas Field?

174 A. That is correct.

Q. Now, Mr. Buck, has the railroad commission at all times, or do you know whether or not the railroad commission has at any time in its proration orders in

the East Texas Field taken into consideration acre feet of sand or sand thickness?

A. Yes, sir, on one occasion they did.

Q. So the order in that field has—I will go back. Do you know whether or not the railroad commission ever prorated that field or allocated the daily allowable on a strictly per well basis?

A. Yes, sir, they did.

Q. Do you know whether or not they ever allocated it on a bottom hole pressure basis?

A. In part bottom hole pressure they did.

Q. Now, then, you said they have at times, or at one time, allocated it in part upon sand thickness or acre feet of sand under a lease?

A. Yes, sir.

Q. But this order now enforced does not take any of those factors into consideration?

A. No, sir, it does not.

Q. Only potential?

A. That is correct.

Q. Now, Mr. Buck, the existing plan of allocation of allowable of wells in the field, in your opinion is that plan necessary to prevent waste?

A. No, sir, the plan has nothing to do with it so long as the top allowable for the field is maintained.

175 Q. What particular part of the present proration order is directed to the prevention of waste?

A. Only the top allowable of the field.

Q. Explain to the Court why you say that.

A. The top allowable for the field—there is a certain efficient rate of production from the reservoir that the commission or the operators dare not exceed in good operating policy to recover a maximum amount of oil from the reservoir. That they have attempted to do in the placing of the top allowable in the field, now at some 522,000 barrels per day. The distribution of that allowable inside of the field has very little or no connection with

the physical waste properties as the commission is attempting to enforce them.

Q. You mean the proper distribution of that?

A. That is correct.

Q. Now, Mr. Buck, I believe it is in evidence here that under the western edge of the field there is water?

A. Yes, sir.

Q. And that the sand at the eastern edge of the field is thinner than the sand in the center of the field, or in the fairway as it has been called?

A. That is correct.

Q. Then it pinches out to a feathers edge almost over to the east edge, the sand does?

A. The sand pinches out to almost nothing on the east edge. It gets thicker on west, but the oil column pinches to the east the same as the sand to the east, so we have an area of maximum thickness through the center
176 of the field.

Q. All right. Now, then, assuming that the railroad commission has determined that 522,000 barrels of oil per day is the most efficient way to produce that field and maintain bottom hole pressures and thereby prevent the creation of waste as it is defined by the statute, if that allowable is allocated amongst wells in the field on a per well basis, or largely upon a per well basis, so that wells over in the western edge of the field where there is the oil underlain with water, and so that the wells over in the eastern edge of the field where the pressures are low, and I believe there is testimony here that pressures are lower in the east edge of the field, is that correct?

A. Yes, sir.

Q. Are allowed to produce substantially the same amount of oil per well per day, and considering further the fact that there are spots of dense drilling, as I believe the testimony has shown, through out this field, is such an order as that, or such a distribution of that allowable more or less likely to create waste than a distribution

of the allowable amongst the wells, or allocation of the field allowable among wells upon a basis that takes into consideration acre feet of sand beneath the lease on which the wells are drilled?

A. The present order—that question is a little lengthy and has two or three points to it—the present order permitting densely drilled areas and tracts of less than one acre with several wells on them to produce the same amount of oil as sparsely drilled tracts would have the tendency to create low pressure areas and lead
177 to physical waste. So long as the top allowable of the field is maintained and the distribution is fairly uniform through there the physical waste factor, if one man loses it the next one gains it, so the ultimate recovery of the field will probably be the same. Densely drilled areas that create low pressure zones do tend toward that physical waste condition.

Q. All right. Now, then, if we just take a cross section of that field, going from west to east, here are wells that are in the sands where the water is pretty close to the top of the sand. A little further on to the east the sand gets thicker, and while there is water under it the water is not quite so close to the top of the sand. A little further east we pass out of the water zone and are in a thick sand, as I understand it?

A. Yes, sir.

Q. Then go on to the east and the sand begins to get thinner and finally tapers on out to where you say you are at the far edge or east edge of the sand. Now, then, going across that cross section, if those wells—if the wells are all allowed to produce, or rather the 522,000 daily field allowable is divided among them on a per well basis, or practically a per well basis, so that the poorest well over at the west—I won't say the poorest, but the well over at the west that can just make twenty barrels is allowed to make twenty barrels and the well in the thickest sand that could make perhaps several thousand barrels

is allowed to make only twenty or twenty-five barrels, and on over to the east where the pressures are lower, 178 a well that can just make twenty barrels is allowed to do that, and that is spread over the entire field—

A. Yes, sir.

Q. Is such a distribution of the allowable among wells calculated or not calculated to cause the wells that are near the water to bring water up into the sand and cause the wells over where the pressures are low to create a low pressure area than would be the case—and thereby lead to waste—than would be the case if the wells or the division of the daily allowable was made amongst the wells and leases on a plan that took into consideration the oil reserves—the recoverable oil reserves under the respective leases on which those wells were located?

A. Plus one additional factor of a pressure adjustment and I would say yes to that question.

Q. All right. Now, then, I believe we had here yesterday testimony to the effect that there was some 21,000 wells in this field—before I get onto that let me ask some other questions, before I leave the subject I was just questioning you on. If the 522,000 barrels daily allowable of this East Texas Field is divided up among the wells and leases in that field upon a plan—can be divided up among the wells and leases in that field upon a plan that takes into consideration the respective—recoverable oil reserves under the various leases in the field without leading to waste?

A. Yes, sir, that can be done.

Q. Can it be done without leading to a fire 179 hazard?

A. Yes, sir.

Q. Now, in connection with that question or that matter let me ask you this: the testimony showed here, I believe, that there was something in the neighborhood of 21,000 or more wells in this field that were allowed to

produce under the existing order only twenty barrels of oil per day?

A. That is right.

Q. Amongst those 21,000 wells, in your opinion, could the wells, could their production, that is wells that can make over twenty barrels of oil per day but now are only allowed to make twenty; could the production of those wells be reduced below twenty barrels per day without damaging the wells and without resulting in a loss of production ultimately recoverable from the field, and without causing the premature abandonment of the wells?

A. I think so.

Q. Now, Mr. Buck, have you made a study of the pro-ration schedule of January 21, 1939?

A. Yes, sir.

Q. Is this the schedule?

A. Yes, sir.

The Court:

Is this the order that is under attack now?

Mr. Moody:

This is the schedule, yes, sir.

A. The schedule.

The Court:

All right.

Q. Now, Mr. Buck, there is a key in that or an index, what do you call it, a scale, in this first page of the schedule?

A. Yes, sir.

180 Q. Now, then, can you tell me from that what pressure—I mean what potential a well has to have before it will be allowed to produce more than twenty barrels of oil per day?

A. Yes, sir, it has to be above 860 barrels per hour.

Q. All right, does that mean that a well that has an hourly potential of one barrel—that would be twenty-four barrels a day, wouldn't it?

A. Yes, sir.

Q. You figure that on a twenty-four hour day?

A. Yes, sir.

Q. Does that mean that a well that has an hourly potential of one barrel—

A. Yes, sir.

Q. And a well that has an hourly potential of 860 barrels—

A. Yes, sir.

Q. That each would be allowed to produce only twenty barrels per day under this present plan of proration as is applied in this field?

A. That is correct.

Q. And that all wells from wells with one barrel potential per hour on up to wells having a potential of 860 barrels per hour are allowed only twenty barrels?

A. Yes, sir, according to this schedule.

Q. The one barrel well is put in the same class, the well with one barrel hourly potential is put in the same class as all wells from there on up as high as those having a potential as high as 860 barrels per hour?

A. Yes, sir.

181 Q. Now, then, I notice up here it says scale 2.32 per cent of hourly potentials. Now, let's see how that figures out, the working of that thing. If you got a well that has an hourly potential of 400 barrels per hour on that schedule it would have 2.32, isn't it?

A. 2.32, yes, sir.

Q. On that basis it would have nine and twenty-eight one hundredths barrels if you just applied the formula of 2.32 per cent of its hourly potential?

A. Something like that. I get 9.3.

Q. All right, but that well is allowed to produce twenty barrels?

A. Yes, sir.

Q. Now, what is your top figure there?

A. 860.

Q. 860. Well, now, if that well is allowed 2.32 per cent of its hourly production how much would it get?

A. Nineteen and a half barrels.

Q. But it is allowed twenty barrels?

A. Yes, sir.

Q. Now, let's take a well that has an hourly potential of 100 barrels per hour.

A. Of course, it would then have 2.32 barrels.

Q. But it would be allowed twenty barrels?

A. Yes, sir.

Q. All right. Now, then—

The Court:

I thought that was made pretty clear yesterday.

182 Mr. Moody:

I don't want to repeat.

The Court:

What is the use of pounding it in so much?

Mr. Moody:

I don't want to repeat, your Honor. I am trying to lead up to the proposition that the 2.32 is not a real factor in the prorating of this field but it is a fictitious factor, that is the end I am trying to reach, and I would like to pursue the question a minute or two further.

The Court:

All right, but I thought it was well brought out yesterday, fully brought out.

Q. Now, Mr. Buck, in the practical results how many wells in that field, or rather in the practical application of this so-called proration or allocation formula, how many wells in the field are actually in their daily allowable are actually affected by the 2.32 per cent or get a benefit of it and how many do not have any benefit of it? That question doesn't state what I want. Change the question. In the practical application of this order to the field how many wells actually in their production get more production by reason of the application of the 2.32 figure?

A. I don't know the exact number of those, Governor Moody. I counted these wells different ways, and I don't remember now the exact number of that tabulation. Around 21,000 of them that were allowed twenty barrels and then there were 463 or 464 or 468 classified as sub-marginal wells and the rest of them were above the 860 barrels per hour.

Q. All right, let's see if this isn't the tabulation. That is the tabulation?

A. Yes, sir.

183 Mr. Moody:

All right. I would like to offer this tabulation in evidence.

Mr. Hart:

Did the witness say he made this calculation from records?

A. Mr. Rowan did, I did not. The work was done in the office from the railroad commission schedule. Mr. Rowan testified yesterday as to the way it was made up, but I did not do the actual picking of the wells out of this schedule.

Mr. Hart:

I have no objection to this if you will have no objection to our using similar information.

Mr. Moody:

No, we have no objection.

(The above referred to tabulation was thereupon received and read in evidence, a copy thereof being attached hereto marked Exhibit 5.)

Mr. Moody:

Now, then, your Honor, I want to correct some figures we got in here yesterday that were not literally accurate.

Q. Are you familiar with the figures shown on that paper?

A. Yes, sir.

Q. Do you know these figures? You participated in the accumulation of this data?

A. Yes, sir.

Q. You and Mr. Rowan worked on this together from this proration figure?

A. Yes, sir, last night.

Q. And you believe these figures to be correct?

A. Yes, sir.

Mr. Hart:

Mr. Moody, I don't think this is accurate either.

184 Mr. Moody:
Sir?

Mr. Hart:

I don't think this is accurate either.

Mr. Moody:

It may not be accurate, but those are our figures from our investigation of those schedules. We may not have figured it accurately, but we believe it is accurate. Its accuracy has nothing to do with its admissibility.

Mr. Hart: .

This is to correct the figures given yesterday?

Mr. Moody:

Yes, sir.

The Court:

What does it purport to cover?

Mr. Moody:

It purports to cover this: We stated the amount of oil in round figures that actually was divided among the wells on the 2.32 factor to be about 14,000 barrels but upon figuring further we find that that estimate was too high, that it is some, I think, 8,250 odd barrels that is distributed on that factor or approximately 1.61 per cent of the total field allowable of 522,000 barrels per day is distributed among the wells on the 2.32 factor. We offer that.

Mr. Hart:

I have no objection if you agree our witnesses may make similar calculations.

Mr. Moody:

We have no objection.

Mr. Hart:

You will have no objection to those calculations being offered in evidence?

Mr. Moody:

No.

(The above referred to document was thereupon received and read in evidence, a copy thereof being attached hereto marked Exhibit 6.)

Mr. Hart:

May I ask, this is of what date?

Mr. Moody:

Made off the January 1, 1939, schedule.

185 (At this time a recess was taken, at the conclusion of which further direct examination of the witness Buck was had, as follows:)

Questions by Mr. Moody:

Q. Mr. Buck, you see the maps there that have been placed up on the board? The one at the top on the left, will you tell me what that map is, what it purports to show?

A. That is the railroad commission potential map of the East Texas Field.

(Said map identified as Exhibit 7.)

Q. Now, what is the map just beneath it here?

A. The map immediately beneath that is a contour map prepared by me on the top of the Woodbine sand.

Q. Does that mean the contour lines show the top of the Woodbine sand in the East Texas Field?

A. Yes, sir.

(Said map identified as Exhibit 8.)

Q. Now, the map over on the right here, the upper map, what is that, please, sir?

A. That is a water map prepared by me showing the wells making water as of September 1, 1938.

(Said map identified as Exhibit 9.)

Q. And the map down at the lower right?

A. The map at the lower right is a sand thickness map prepared by me.

(Said map identified as Exhibit 10.)

Q. Now, Mr. Back, taking this map, Exhibit 7, I notice on the map certain circles, large circles around wells and figures opposite. For instance, the pointer is now 186 at such a well with the figure 912 opposite it. What does that indicate on this map?

A. That indicates a key well that a potential was taken on, and the potential at the time the well was tested was 912 barrels per hour.

Q. All right. Now, then, the largest figure that I notice here, I see here is at this point 1,003—1,005, down here. It is near Lake Devernian. That indicates that that was a well that had—one of the key wells with a potential of 1005?

A. Yes, sir.

Q. Now, is that the highest potential shown on this map?

A. I haven't examined it for any higher wells. I believe that it is just about as high as any well; there seems to be one on the Humble. I believe that is Kengarrer, I am not sure, with a potential of 1,119 barrels.

Q. It doesn't give the survey?

A. Yes, that is in the Merridith-McCabe Survey.

Q. That is illustrative of what is meant by these various wells with figures around it, the circle indicates the potential was taken and the figure represents the hourly potential as taken by the railroad commission?

A. Yes, sir.

Q. Now, as we get near the west edge of the field I see here on the Humble O. K. Johnson lease, near the town of Gladewater, I notice a key well with the figure 805 and one with 803, two wells close together. Now, in that particular area I don't find any wells that are closer 187 to the west edge of the field. Further down to the south, a well here on the Sinclair-Prairie near the town—in the James Jordon Survey, I find a well with 582 opposite it?

A. Yes, sir.

Q. Now, then, from those two wells how do they project—from such wells how do they project these contour lines out to the west edge of the field?

A. The contouring system as adopted by the state was first to draw a zero line of non-production or zero line of sand thickness around the entire periphery of the production. Zero on the north, south, east and west. Then the wells were taken, such as the well at 582 barrels as you indicated, and the contouring was more or less even spaced between 582 and zero on just an average step-down of 100 barrels decrease at each even step going westward. The same was true in going eastward and north and south from any of the key wells as put on the map.

Q. All right. Now, let's assume that this particular well you have here, 582, the figure 582 opposite it, and another well that was even further to the west than that, if it had been equipped differently and had been drilled into the sand deeper than this 582 well might the allowable in such a well be greater than the 582, although it might fall within some of these contour lines showing an area less than the 582 area?

A. It is entirely possible that there would be wells west of that that would have a higher potential. The operator in most instances would be afraid to take that potential.

188 Q. Now, then, is that generally the way the potentials were determined around the edges of the field?

A. Yes. It is rather difficult to see the main key wells, but if you put a small red circle through the general area showing the outpost wells—the red dots in there now give more or less a picture of the furthest wells westward and the furthest wells eastward that the state used in making their potential map.

Q. I am going to take this well right here that my pencil is on?

A. Yes, sir.

Q. What well is that?

A. We will put it in red so we can identify it.

Q. Call it X well. We can't read the name on the map. Do you see any well between that well and the west edge of the field, and from here to the east edge of the field, over near Joinderville, and to the south of Joinderville, that appears that any potential was taken?

A. No, sir, I do not see any.

Q. Take this well right here. We will call that Y well. Do you see any well on which this map shows a potential was taken from this Y well clear on out to this southwest edge of the field?

A. Southwest?

Q. Southwest edge of the field?

A. No, sir.

Q. Now, Mr. Buck, do you know whether or not—have you had any experience in the East Texas Field that enables you to say whether or not all wells that are shown by this map to lie between these various contour
189 lines will actually have a potential that would be indicated by the contour lines between which those wells lie?

A. Yes, sir, I have had such experience as that and made such investigation.

Q. All right, tell the Court about it.

A. About six months ago I had occasion to check around 156 wells in the East Texas Field for appraisal, and those wells were lying on the east edge of the East Texas Oil Field, north or immediately around the town of Joinderville, as indicated by the pointer, and going to the north line of the Issac Parker Survey about where I pointed here, I believe.

Q. Let's put the letter A here for Joinderville and the letter B for the approximate north line of the Issac Parker Survey.

Mr. Hart:

If the Court please, we wish to object to this line of testimony for the reason that the area that he is now asking about is some considerable distance, approximately twenty-five miles I would say, from the Rowan & Nichols lease, perhaps farther than that, and this evidence doesn't tend to show in any manner how Rowan & Nichols may be affected by any error that occurred down in that part of the field.

The Court:

What do you say, counsel?

Mr. Moody:

I think, your Honor, the testimony is admissible as bearing upon the general accuracy of the plan. The fairness of the whole plan is under attack. We are showing that it affects us directly and supporting that by general testimony that the plan has that general effect.

190 The Court:

It might be that the plan is valid generally and not valid as to your particular client.

Mr. Moody:

Yes, sir, but I think the testimony that it was an inaccurate plan would support our contention that it was invalid as to us.

The Court:

Overrule the objection.

Mr. Hart:

Note our exception.

Q. What does your investigation of the 156 wells disclose?

A. The 156 wells lay in the portion of the field as indicated between the red A and the red B, and the majority of them were between the 100 and 200 barrel contour and the rest of them were between the 100 and the zero barrel contour, and none of the 156 wells, that is not one single one of them, was capable of making twenty barrels per day on the pump.

Q. Now, do you know whether or not—I will put it this way: Is there any machinery made with which a well that has to be pumped, any machine with which you can pump 300 barrels a day out of those wells?

A. Not from those depths and actually pumping. There are many wells you can agitate and get that much, but not pumping.

Q. Do you know whether there are many or few wells actually on the pump in the East Texas Field, shown on that map to be in or between the 200 and 300 potential contour line?

A. Yes, sir.

Q. Can you pump 300 barrels an hour out of any well?

A. Not that I know of.

Q. With any available pumping equipment in the East Texas Field?

A. I have never seen any pumping equipment in the East Texas Field that had a capacity of 300 barrels an hour.

Q. Do you know whether or not there are few or many wells in the East Texas Field that are now on the pump but which are shown on the potential contour map to be between the 200 and 300 barrel contour lines?

A. Yes, sir, there are many such wells. I have checked them through the area from Joinderville to the Issac Parker and also from Kilgore north and have found that many, many a pumping well is in that area that will pump twenty barrels or slightly more, but there are still many that were not capable of pumping twenty barrels per hour.

Q. But are still shown to be between the two and three hundred contour lines on that map?

A. Yes, sir.

Q. All right. Now, explain the map—we have now been talking about Plaintiff's Exhibit 7?

A. Yes, sir.

Q. Now, explain Plaintiff's Exhibit 8 and tell how that map is made.

A. Plaintiff's Exhibit No. 8 is a contour map on the top of the Woodbine sand from as much well data as I could obtain. When I left the commission in 1933 I had the well data and maps on some 12,000 wells. After that time I checked as many additional wells as I could, and had made available to me many additional well records, and this contour map is based upon the point of depth where the Woodbine Sand Section was encountered at the base of the Austin Chalk, and subtracting the well elevation from that depth to get the sub-sea elevation.

192 The map is contoured on a twenty foot interval, and goes from minus 3,320 feet to approximately 3,140 or 3,120 feet up structure.

Q. All right. Now, with that map can you determine with reasonable accuracy the top of the Woodbine sand under any particular lease in the East Texas Field?

A. Yes, sir, the control of datum points in the East Texas Field is of such magnitude in proportion at this time that it is almost impossible to conceive of any condition within this field that couldn't with very reasonable accuracy—that you couldn't with very reasonable accuracy forecast where a well would hit the top of the Woodbine sand before it was drilled.

Q. Now, is information such as that map discloses and such information as from which the map was made, is that available to the railroad commission?

A. Yes, sir, this type of information is. There has been many publications on it. There has been very free exchange of this type of information, so much so that I

think that practically any one in Texas so interested could obtain such information as to construct such a map of the East Texas Field as this.

Q. Take Exhibit 9 and explain to the Court how that map is made and the data used in the making of that map.

A. Plaintiff's Exhibit No. 9 is a water map of the East Texas Field. The heavy black line as indicated on the west is the minus 3,320 contour line, as indicated on the contour map.

Q. That is as indicated on Exhibit 8?

A. Exhibit 8, yes, sir. The area shaded in light green on the west of the minus 3,320 foot contour line 193-- indicates that all of the area outside of the minus 3,300 was the non-producing west edge area of the East Texas Field. Any wells drilled on the outside of that line, with one or two rare exceptions, were water wells when they were completed. The wells inside of it or eastward of the black, heavy line, and associated in a light blue and indicated by a small brown circle, are wells that either were drilled into the water at the beginning of the field or water encroachment has approached to those wells and they are now producing water, as of September 1, 1938, as far as I could determine.

Q. Well, then, does that map show that part that is—does Plaintiff's Exhibit 9 show that part of the East Texas Field into which water has encroached since the field was brought in?

A. Of course, Counsel, you realize that there is quite an extensive area underneath the field where the water has advanced to. This map only shows those wells that are making water, or the area in which water has encroached to the producing wells, as indicated on the surface. It has no bearing on how much the water line has advanced underneath the field, but every well that has made water has been checked in that rough line to indicate the advance of water since the beginning.

Q. All right. Now, explain Plaintiff's Exhibit 9—10, to the Court, and tell the Court the data or information which that was made from.

A. Plaintiff's Exhibit 10 is a sand thickness map of the East Texas Field. It was made up by a construction of three other maps, and the Exhibit No. 10 is a composite map of those three maps, beginning with a surface contour map, I mean a top of sand contour map, the limits of the Woodbine sand and the water area, at first from zero to possibly 3,200 feet was placed on the map, very similar to the contour map of the East Texas Field.

Mr. Tilley:

Refer to that by exhibit, Mr. Buck.

A. As Exhibit No. 8. I then had occasion to study some 450 Schlumberger logs that had either penetrated the entire Woodbine section into the Georgetown or penetrated the Woodbine section down to the water or had penetrated into the Woodbine section and given me some indication of the sand thickness by those wells, the red dots indicated in triangle, squares and circles are so shown on the map from north to south.

Q. What is the difference between the wells shown with a red triangle around them?

A. The red triangle indicates a well that was drilled through the entire Woodbine section from the top—I mean from the base of the Austin chalk to the Georgetown lime, and a Schlumberger run on there and given the entire sand section, shale section, and everything about the producing horizon of the East Texas Field. The ones shown by a square are wells that were drilled from the top of the Woodbine section and later went into water and were abandoned, were quit when they went into water, and a Schlumberger was run to give us the entire sand section between the top of the sand and the water table. The

wells that have a real small circle with a symbol to the side of them just showed the maximum penetration of that particular well and offer some control as to sand conditions. In the preparation of that map some 195 460 Schlumberger logs were studied.

Q. Now, do you have those Schlumberger logs here with you?

A. Yes, sir.

Q. And subject to examination by the defendant's counsel?

A. Yes, sir. With the Schlumberger logs that have penetrated the entire Woodbine section I constructed a top of Georgetown lime map very similar to the contour map that is shown in Exhibit 8, and with the Georgetown limestone map underneath the contour map and a check on the farthest east advance of the water I made a sand thickness map. This is just an isopach showing lines of equal thickness between the two maps that I have prepared and the contours on the map are in contours of twenty feet where the highest area of closure is 100 feet of Woodbine section, and the ~~second~~ highest area of closure is eighty feet of Woodbine section.

Q. What is the red line I see running down through the map?

A. The red line that extends from north to south on the sand thickness map is a line that I call the zero line of maximum recovery. All wells lying to the west of this red line, under the present plan of proration, are having oil pushed up-structure and removed from their property, and they recover less than that oil which was originally in place.

Q. Now, is that under the present plan of proration?

A. Yes, sir.

Q. All right.

A. All of the wells and leases that lie to the east side of the red line indicated as a zero line of maximum recovery recover more oil than they have in place.

196 Q. Is that under the present plan of proration?

A. Yes, sir.

Q. Now, I want you from this map—from this map can you tell the approximate sand thickness of any lease in the East Texas Field?

A. Yes, sir.

Q. Find the Rowan & Nichols twenty-five acre lease we have been talking about.

A. The Rowan & Nichols twenty-four point ninety-five acre lease, the Todd B lease, is now indicated as the red lease on the map.

Q. All right, what is the sand thickness on that lease, under that lease?

A. The closest contour to the Rowan & Nichols lease is the 100 foot sand thickness contour that goes just immediately west of the west line of the Rowan & Nichols lease. The next contour, the eighty foot contour, is on to the east, and by interpolation you could say that the western part of the Rowan & Nichols lease had from 95 up to 98 feet of Woodbine section and the eastern half had from 95 down to approximately 93 feet, or an average of 95 feet of Woodbine section under that lease.

Q. All right. Now, is that lease east of your so-called zero line? That is, is it a lease which, under the present plan of proration, will recover less than the amount of recoverable oil under it, or is it one of those leases which, under the present plan of proration, will recover more than the amount of recoverable oil under it?

A. The lease lies west of the zero line of maximum recovery, and under the present plan of proration will lose oil up-structure to its more fortunately located neighbor and will not be able to recover that amount of oil in place, or of recoverable oil that was in place under its land.

197 Q. All right. Do you think that condition or result could be corrected, or that condition would be corrected by some different plan of allocating allowable production among wells in the East Texas Field?

A. Yes, sir.

Q. Could it be corrected without creating waste?

A. Yes, sir.

Q. Now, have you made a cross section of that field near the place where the Rowan & Nichols lease is located?

A. Yes, I have prepared a cross section as indicated by a light green line marked A-A that runs between the Rowan & Nichols A lease and the Rowan & Nichols B lease and goes from a west to east direction across the entire field.

Q. All right, let's make those letters in red so they can be seen a little better, if you don't mind, please, sir (marking on map). All right, now, the line of cross section shown by the red line, that runs in an easterly and westerly direction across the field?

A. Yes, sir.

Mr. Moody:

Let me see that cross section map, please.

Mr. Hart:

Did the witness say he prepared this himself?

Q. Did you prepare this yourself?

A. I did not do the drafting on it. I placed
198 the wells that are on there and penciled it on
there and then employed a professional drafts-
man to do it, because I am not very neat with a pen and
ink.

Mr. Hart:

All right.

A. But I prepared the exhibit, yes, sir.

Q. All right, Mr. Buck, explain Exhibit 11 to the Court, please, sir.

A. Exhibit 11, taking into account seven wells, as indicated on the red line A-A through the East Texas Field from west to east in direction. The wells as shown by the Schlumberger log penetrated in some instances, such as the Humble Sheppard No. 11, to just above the water table, the Shell Richey No. 6 drilled into the water table, the Atlantic Tooke No. A-87 drilled down through the Woodbine sand section, the Shell Bashum No. 9, the Stanolind Arms No. 11, and Stanolind & Sims-Pearson No. 7, with those Schlumberger logs showing the sand thickness, shale breaks and water level of the East Texas Field, I constructed this cross section.

Q. Where is the water, point that out, please, sir?

A. The original water line of the East Texas Field as shown by the red line was at a minus 3,320 feet. You will notice that there is a rise above that horizontal line of minus 3,320 feet at the present time, and that is indicated by the advance or rise in the salt water as the oil has been taken out of the field.

Q. Well, that water, then, is indicated by that light blue color, I guess, isn't it?

A. Yes, sir, water is indicated by the light
199 blue color, and the brown speckled area is that area that is saturated with oil.

Q. All right, let's mark that water with a big letter A.

A. A?

Q. Yes, sir, in red. Now, then, where is the saturated Woodbine sand?

A. The saturated Woodbine sand—

Q. What color do you show that by?

A. It is in the brownish yellow color.

Q. Let's indicate that, then, by the big letter B.

A. Yes, sir.

Q. Now, what is that right over there at the east or at the east underneath the yellowish brown color that you have lettered B and which represents the saturated Woodbine section?

A. The dark cross section immediately under the east one-half or third of the field is a base of the Woodbine sand section and is indicated here as the Eagleford shale zone.

Q. All right. Now, let's mark that with a letter C, the Eagleford shale zone, I believe you called that?

A. Yes, sir.

Q. Now, over at the east—west, I mean, and above what you have indicated as the Woodbine sand, I see a dark colored strata indicated there. What is that?

A. That is the Austin chalk that lies immediately above the Woodbine sand.

Q. All right, let's mark that with the letter D.

A. Yes, sir.

Q. Now, then, which well indicated on that 200 cross section is nearest to the Rowan & Nichols twenty-five acre lease?

A. The Rowan & Nichols lease lies between the Allen-Tooke, Atlantic Allen-Tooke A-7, and the Shell Bashum No. 9, in approximately this position (drawing on map).

Q. Mark the line you have drawn there Rowan.

A. Yes, sir.

Q. All right. Now, then, where is that Atlantic Tooke No. 7—A-7 well, on the Plaintiff's Exhibit, No. 10?

A. Here.

Q. Where is the Shell Bashum No. 9 on Exhibit 10?

A. Here.

Q. You marked those two wells with a red circle around them?

A. Yes, sir.

Q. All right. Now, Mr. Buck, the cross section, then, does it or not support your previous statement with respect to the thickness of the sand underneath the Rowan & Nichols lease?

A. Yes, sir.

Q. Now, you have indicated there on your map, or you have mentioned shale breaks?

A. Yes, sir.

Q. I don't believe we have given any letter there to shale breaks.

A. No, we have not.

Q. That will be—let's call that E.

A. Yes, sir.

Q. Now, do those shale breaks run continuously through the Woodbine sand, or is it a matter of just lenses
201 of shale breaks in the Woodbine sand?

A. There is some of the shale to the west that may run continuously through and pinch out against the top of the Austin chalk, but as a general rule those shales come in and go out in a lenticular manner in a very similar way with which your sand thickness does when you go from east to west.

Q. Do the shale breaks prevent the migration of oil from east to west in that field—from west to east in that field?

A. No, sir, they do not.

Q. Now, yesterday you told me that the average porosity in the East Texas Field was about twenty-four per cent?

A. Yes, sir.

Q. Now, I think you said if you took a core through the sand—does that mean a core taken through the sand here at the east or a core taken through—I mean at the west, or a core taken through the sand at the center, or through the sand here at the east, would show an average porosity of twenty-four per cent from top to bottom of the core?

A. I call your attention to the Schlumberger indication of the porosity, and the crooked line on the left side of each Schlumberger indication is the porosity measurement of the Schlumberger log; right down through the center of each well would be your zero line, and as the porosity line moves away from zero you would expect and get a greater porosity of sand. You will notice as we go through

a shale section the line approaches the zero line through the center of the well. As you come back into the sand the porosity goes out away from the zero line. When you come back into a shale the line goes back toward zero. Immediately upon going through that shale the line goes back out and upon going into shale it goes back toward zero, and you will note from all of the Schlumberger logs a very, very uniform porosity indication on the Schlumberger logs; so through your sand section there unquestionably you would have a uniform average porosity there, and it would only be in such sections as a thin sand section through shales where trashy conditions would prevail, and I think that a porosity of twenty-four per cent, as I have given, is a very conservative figure after studying these better than 400 Schlumberger logs.

Q. All right. Now, what per cent, or what is the per cent of saturation in the Woodbine sand?

A. By saturation you mean oil saturation or water saturation?

Q. Oil saturation I mean.

A. In preparing that formula, Mr. Moody, I took a net sand thickness or an average net oil thickness by studying the Schlumberger, took a porosity factor of twenty-four per cent, a shrinkage factor for the oil from reservoir to surface of sixteen per cent, and a connate water per cent. in the sand of twenty-one per cent, and a recovery factor of seventy-five per cent of the oil in place.)

Q. All right. Well, now, then, in the particular part of the sand, or particular part of the field where the Rowan & Nichols lease is located, what do you estimate to be—what would you say is the net saturation there? You said his sand thickness was about ninety-five. What would you say his saturated sand is?

A. Sixty-five feet.

203 Q. Sixty-five feet of saturated sand?

A. Yes, sir.

Q. What would you estimate to be his porosity?

A. Twenty-four per cent.

Q. Twenty-four per cent porosity and sixty-five feet of saturated sand?

A. Yes, sir.

Q. Now, then, those two factors, saturation and sand thickness, have to do with the amount of oil in place, is that right or wrong?

A. That is correct.

Q. Does the permeability of the sand at that particular place have anything to do with the oil in place?

A. No, sir.

Q. You have been talking about Schlumberger logs here, or electrical logs. The Schlumberger is a name for an electrical log, it is the name of a company that makes electrical logs of wells?

A. Yes, sir.

Q. How extensively are they used, and are they or not regarded as accurate by petroleum engineers and other scientists and oil operators?

A. The Schlumberger log is now universally used everywhere that we explore and drill for oil in the United States and foreign countries in all wildcat wells or out-post wells, and in the early development stages of the field every operator universally uses the Schlumberger or its competitive instrument. In the East Texas

204 Field, of course, the Schlumberger was not brought to this country until 1934, so we had no Schlumberger logs prior to that time. Many of the operators considered that they had sufficient data on the East Texas Field and did not go to the additional cost, but I understand that there has been some six hundred Schlumberger logs that have been run in the East Texas Field, and they are continuing to run them at all times. Now there is one truck kept at Tyler, Texas, and it is kept busy most of the time in the East Texas Field, all the time.

Q. It is regarded as an accurate method?

A. Yes, sir.

Q. Now, Mr. Buck, you said awhile ago your red dash line that runs generally from north to south on plaintiff's Exhibit No. 10 is what you call the zero line?

A. Yes, sir.

Q. And that all wells east of that line—west of that line would produce, under the present plan of proration, would produce less than the amount of recoverable oil originally in place under that, under their respective leases; or let me change the question. I understood you to say that the dash line that you referred to on Exhibit 10 as the zero line, you said that the leases east of that line—west of that line, would, under the present plan of proration, recover less than the amount of recoverable oil originally in place under those leases?

A. Yes, sir.

Q. You said the Rowan & Nichols tract was one of those that would, under the present plan of—

205 The Court:

Counsel, let me make this suggestion: You are setting your stage here so elaborately that it takes too much time. I think you have enough background now to draw your general conclusion and bring this witness to a close, and let the adversary party feel him out on cross examination. The first thing we know we will be like the man who couldn't see the forest for the trees. You will get so much data in here we can't see the forest.

Mr. Moody:

I don't want to obscure the point.

The Court:

There is a great deal of repetition on this, and I think we have the matter pretty well in view. I don't want to curtail you on your record, I realize you have to get all this in your record.

Mr. Moody:

I want to ask him this question; Judge, if he can, from that cross section map, illustrate what he meant by his red line on Exhibit 10 and tell us why that result will be reached under the present plan of proration?

A. Yes, sir, the red line as indicated on the map was the result of several cross sections from the east to west directions through the East Texas Field very similar to the one indicated here. Those cross sections were then plotted on a graphic scale and the volumetric content of the reservoir was computed—I mean the volumetric content of cross section was computed. Then, as the water level rose and flooded out areas, on the assumption that the present plan of proration was in effect and that there was equal spacing of wells along the entire cross section

and a uniform withdrawal from each well, these
206 calculations were determined and each section north and south through the cross section was divided into 3,000 feet from west to east. Each 3,000 feet meant a new zone. In some of the cross sections there were only seven zones. Some sections went as high as fourteen zones, but as each zone was drowned out by water the other zones were still producing to the east of it, and those calculations were made and from the calculations it was determined that the first zone and the zones following it to the east were not recovering the amount of oil that they had in place. At some point along this cross section east of where the Woodbine border intersected the Georgetown lime wells began to recover more than that amount of oil they have in place, and across this cross section I have found areas where a man only recovered as much as nineteen per cent of the amount of oil that he had in place, and going to the eastward and past this zero line of maximum recovery I have checked wells—leases, and calculated where they recover as high as six hundred per cent more oil than they had originally in place, because of this present method of allocation.

Q. All right, does the present method of allocation allow the oil to move from east to west faster than the fellow can get the oil now present out from under his land?

A. That just depends on how many wells he has and the size of his tract. If he has a tenth of an acre he is getting it out faster.

Q. Through this west half of the field that is the case generally, that the oil is being pushed to the east faster than the wells in the east half can take it out, except where a fellow has a well on one acre or something like that, isn't that true?

A. All of the wells drawing on this entire cross section are responsible for the movement of the water upward and eastward.

Q. Now, have you platted those experiments that you made out on coordinate paper?

A. Yes, sir.

Q. Now, explain to the Court what that paper is.

A. A cross section or graph that I now have, marked Plaintiff's Exhibit No. 12, is a replica of the cross section on the board, but it is drawn to a graphic scale instead of to a different horizontal and vertical scale as indicated on the map, and is coordinated in square inches and divided into twelve and a half zones, and the volume of each zone computed, and then by advancing the water or rising the water in the cross section and growing out to the west I have computed the amount of oil that would be taken out and how much oil each cross section would have produced under the present plan of proration prior to the time that the water completely drowned it out.

Q. All right.

A. Each zone was also calculated for its cubical content, and the difference between what it produced and what it had in place is the basis for determining this zero line of maximum recovery.

Q. All right. Now, can the accuracy of your work there be demonstrated in a laboratory by checking of a device that represents an oil reservoir and using laboratory equipment to demonstrate the accuracy of that?

A. Yes, sir.

208 Mr. Moody:

We offer this in evidence. I might say that I now offer in evidence Plaintiff's Exhibits 7 to 12, inclusive, subject to the right to substitute—return your contour map, Mr. Cottingham, and substitute a copy for it. May we do that, your Honor?

The Court:

Yes.

(The above referred to exhibits were thereupon received in evidence, same being identified as PLAINTIFF'S EXHIBITS Nos. 7, 8, 9, 10, 11 and 12; the same being sent up in the original.)

The Court:

How close to the top is that Woodbine sand? How close to the ground surface does that Woodbine sand get?

A. On the surface?

The Court:

Yes.

A. It outcrops on the surface.

The Court:

Does it carry oil there?

A. No, sir.

Mr. Moody:

We misunderstood. We were under the impression that the Railroad Commission had a sand thickness map that would be available to us, Mr. Hart.

Mr. Hart:

Our agreement was that you could examine any exhibits that we had. We didn't agree to produce any exhibits. I don't recollect that we told you we had a sand thickness map. We said you could use Mr. Hudnall's map.

Mr. Moody:

The Railroad Commission has no sand thickness map?

Mr. Tilley:

Will you state that the Railroad Commission has no sand map of any kind?

209 Mr. Cottingham:

They haven't instructed us to send any map.

Mr. Tilley:

Didn't they have one that was prepared by another engineer?

Mr. Cottingham:

No. Mr. Hudnall said he prepared one while he was in the East Texas Field, but we couldn't find it. I put in a telephone call and our engineer said it wasn't there.

Mr. Tilley:

Somebody told Mr. Herman Jones, in Mr. Moody's office, that you would let us have that map, so somebody must be mistaken.

Mr. Pollard:

The agreement was, you asked us at San Antonio if you could introduce without objection Mr. Hudnall's map, and we agreed.

Mr. Tilley:

Those maps are public and we have a right to them.

Mr. Pollard:

Have you a copy of that transcript?

Mr. Tilley:

It is a public record. We can have it brought down here by subpoena.

The Court:

They say they haven't one. Do you want that checked up again. I am sure they will check it.

Mr. Tilley:

We will have to wait until they get on the witness stand.

* Q. Mr. Buck, from your acquaintance with the East Texas Field are you able to say whether or not there were few or many instances in which sub-divisions were made of tracts of land subsequent to the bringing in of the field, the discovery of oil in the East Texas Field, and wells later acquired on these areas?

Mr. Hart:

We object to that as being irrelevant and immaterial and a collateral attack on the granting of permits by the Railroad Commission, and which have not been attacked, and if attacked were upheld by the Courts.

The Court:

What is the materiality?

Mr. Moody:

To show some explanation of some of these—

The Court:

I suppose you have to get these things in the record, but the Court and Circuit Court both have had so much to do with this field that you ought not to labor these points too hard. We know a little bit about the field.

Mr. Moody:

I withdraw that. That is within the knowledge of all Courts and they can take judicial knowledge of it.

Q. Now, Mr. Buck, one or two further questions. In the East Texas Field is or not the tendency there for oil to move from points of high pressure to points of low pressure?

A. That is universal in every field, Mr. Moody.

Q. All right. Well, is it—under the present plan of proration, with densely drilled areas in various parts of the field and the wells allowed to produce as it has been indicated by the proration schedule, no allowance being made for acreage and acre-feet of sand under any lease or allocating allowable to wells, is the tendency and the practical application of that order to the field, and in the operation of the field, is it to cause oil to migrate and pressures to pass from points less densely drilled to the points more densely drilled?

A. Yes, sir.

Q. Now, you were asked yesterday some questions about the density of drilling in Joinerville and London and Kilgore and various other towns in the field. Is there also dense drilling or drilling that is more dense than the average of the field closer to the lease of Rowan & Nichols than the townsites referred to?

A. Yes, sir.

Q. To the east of the Rowan & Nichols is there more dense drilling than the average of the field and more dense drilling than on the Rowan & Nichols lease?

A. The areas circled in red are all east of the Rowan & Nichols lease, and all have a greater well density than the Rowan & Nichols tract.

Q. All right, another question. In the East Texas Field do you know whether or not there are quite a number of wells over there pumping less than five barrels per day?

A. According to this Railroad Commission schedule there are some pumping and producing one barrel per day.

Q. In other words, the operators are continuing to operate for the one barrel of oil they can get out of them?

A. Yes, sir.

Q. Is that injurious to the wells or property to operate them when you can get only one barrel a day?

A. Injurious to the well?

Q. Or the property or the lease?

212 A. Not that I know of.

Mr. Moody:

Take the witness.

Cross Examination.

Questions by Mr. Hart:

Q. Mr. Buck, is it your testimony that there will not be any waste caused by reducing the output or allowable of the wells to something like five barrels or less per day?

A. I beg pardon.

Q. Is it your testimony that there will not be any waste caused by reducing the allowable of a well to say five barrels or some figure of that kind, per day?

A. It is not my testimony unless the question is qualified a little further. You could do that and cause waste or you could do that and not cause waste.

Q. Is there a minimum or not below which you cannot safely reduce the allowable of a well without tending to cause waste?

A. The only way that I know that you can hurt a well is to take oil out of it. Now, we start from there and come up.

Q. Well, how would you answer my question? Do you say there is any minimum or not below which you cannot safely go without tending to cause waste?

A. I don't quite follow your questioning, Mr. Hart. I will make this statement. Maybe it will clarify it. That it is entirely possible with a great majority of wells in the East Texas field to produce them at a rate of five barrels per day without creating waste. It is also entirely possible to produce them in such a manner at five barrels per day that they would cause waste. That is a problem—I mean a question that can be answered yes or no. Unless you give me something more definite to base my answer on.

Q. Taking an average well in the East Texas field, what would you say would be a safe minimum that you could go down to without tending to cause waste?

A. Well, Mr. Hart, you can take any well in the East Texas field, good or bad wells, take the best well over there, and if we put it on a daily allowable of five barrels per day, that well, a flowing well now, would not be flowing at the end of two weeks. The well would then have to be put on artificial lift or agitated or something like that, but the oil is still there and the well could be produced, and I see nothing between the fact that where they flowed its oil under a condition of five barrels every day or they took out twenty-five barrels every fifth day or anything like that, that that comes under this question of waste. The only waste that could occur, as I see it, is either to produce at a rate that would be excessive or at a rate to where they abandoned the property and left the oil in the sand. That is the only two things that I can conceive of in the answering of your question.

Q. Let me see if I understand you. You say if you allowed one of those flowing wells five barrels per day that they would within a short time have to use artificial lifting to get the oil out of the well. I believe you said a few weeks?

A. Yes, sir, a matter of about two weeks.

Q. About two weeks?

A. Yes, sir.

214 Q. Now, that is an average well in the East Texas field?

A. Yes, sir, that is correct.

Q. Now, why would you have to begin to use artificial lifting after about two weeks if you had a minimum of five barrels, if you allowed them to produce only five barrels?

A. Here is why you would. The oil in the East Texas reservoir weighs 32.3 pounds per foot in the flow column. If you have a well in there that has two and a half inch tubing 3600 feet long, it would contain approximately twenty-seven barrels. That would be the capacity of that tubing.

Q. All right.

A. Now, if you produce this well at five barrels every day you would be five days emptying your tubing. Now, as you pull up five barrels and stop coming up, like an elevator, and resting that amount of oil in the tubing, gas is liberated from that oil as it passes a pressure point of 725 pounds, and the oil that is accumulated in that tubing gets a weight greater than 32.3 pounds per hundred feet. The reservoir pressure in the field at the present time isn't sufficient to kick out of a well a column of oil that weighs more than 32.3 pounds per hundred feet. If this whole 3600 foot column was present in the well there is no waste there. The gas served the purpose, it brought the oil to the well and lifted it and filled it in the hole. There is no waste there. But you have to get that twenty-seven barrels of stagnant oil out of that tubing before new oil can come in. Now, if you produced the well every tenth day and produced fifty barrels every ten days, you could keep that well alive indefinitely.

215 Q. Well, then, in order to do that, by producing only five barrels per day you don't make the full use of your reservoir energy or pressure there, do you, at a certain length of time, say two weeks, in producing it that way you lose the effect of the reservoir pressure there,

and have to use that artificial lift in order to get the oil out of the well?

A. No, you haven't lost any effective pressure at all. Your pressure is still there, but it isn't sufficient to kick the oil on out of the well.

Q. Because of the conditions that have been created in the tubing, as you have described in detail?

A. Yes, sir.

Q. Now, on the other hand, instead of producing the amount of the allowable production of the well, say at five barrels, say you reduced it to about twenty barrels. Wouldn't that effect that you have spoken of be considerably reduced?

A. In some instances yes. It would be considerably reduced; but you still have that same kind of well.

Q. It would be considerably reduced in every case, wouldn't it?

A. There would still be wells in the East Texas field that would have to be agitated or kicked off with a twenty barrel allowable.

Q. I understand that, but there would be fewer wells if you allowed a twenty barrel allowable than if you allowed say only a five barrel allowable?

A. That is correct.

Q. That is correct, isn't it?

A. Yes, sir.

Q. And so by allowing the wells in the field a twenty barrel allowable, you lengthen the flowing life of those wells, and you postpone the day when they are going to have to be produced by artificial lift?

A. You lengthen the flowing life?

Q. Yes.

A. Yes, sir, that is a correct statement.

Q. And of course by lengthening the flowing life, that postpones the time when you are going to have to put those wells on artificial lift?

A. Yes, sir.

Q. Now, I would like to ask you a few questions about some of these exhibits here, Mr. Buck. First let's take this last exhibit you put up here. I believe you pointed out that this exhibit 11 was not drawn to the same horizontal and vertical scale, your horizontal and vertical scale is different?

A. Yes, sir, it is so indicated on the exhibit.

Q. Now, these wavy lines which are drawn beside these diagrams indicating the well bores here, are they drawn to scale there? How did you arrive at the distance out from those well bores that you would show those wavy lines?

A. I can best show you—

Q. Before you go into that detailed explanation, may I ask you do you mean to say that these wavy lines out here indicate the condition of the sand as far out on the structure as these lines, according to your horizontal scale?

A. No, the horizontal scale is one inch to 500 feet, and one of these small Schlumberger logs was just slipped under the tracing paper and traced off. Of course,
217 this doesn't mean by any means that the Schlumberger represents or penetrated 1000 feet in each direction from that well.

Q. Actually, a Schlumberger test shows the condition outside of the well bore to what distance, if any distance outside the well bore?

A. The first curve on the Schlumberger or the one represented by a solid line has a maximum penetration of the sand of around three to six inches outside of the well bore.

Q. Excuse me. That is the line of the right hand side?

A. Yes, sir. We have three lines here. The solid line has a penetration of around six inches.

Q. All right.

A. The one indicated by the dashed line has a penetration of around two feet, and the one indicated by the peppered line has a penetration of about four to six feet.

Q. Now, these lines on the right are what indicate a resistivity, is that correct?

A. Yes, sir.

Q. Now, the solid line, what does that indicate?

A. They all indicate resistivity. The different reasons for using the first, second and third and some of the later Schlumbergers have a fourth curve on that side so as to give that further penetration in there. Sometimes the first curve runs through the sand and gives an indication of water because it is a drilling fluid that is left in the sand and your interpretation of that resistivity would be water rather than oil, so they have made these additional curves that penetrate further, to get away from the contamination of the hole.

218 Q. Now, these curves on the right, if you have oil say in place there will indicate—the curve will go out from the well bore, will it not?

A. Correct.

Q. Because the oil has high resistivity?

A. That is correct.

Q. What would indicate there a low resistance, is there anything except oil that would indicate a high resistivity?

A. Yes, quite often limestone or sands that have any calcium materials in them show a very high resistivity.

Q. What about shale and volcanic ash?

A. Shale and volcanic ash, as you can see here, offer in some instances high resistivity, depending on the tightness of your section and sometimes low. The interpretation there is a combination of studying both sides of the well log.

Q. Well, where these lines go back and forth they are not regular, they go out and come in, and so forth. They indicate a difference in the resistivity, which would indicate a difference in the amount of oil in place, wouldn't it?

A. No, sir, that could not be said.

Q. What would it indicate?

A. It indicates this instrument is lower down in the hole. Take the Shell Richey No. 36 and make an interpretation of this log from top to bottom. If we left the base of the Austin Chalk we go into a very thin sand section—I mean a shale section. It has no porosity, but it is apparently saturated with something. This log kicks out to the resistivity side. We come through a sand section there, that shows porosity but very little, if any saturation. We go through a shale part in here.

219 That shows very little porosity and practically no saturation. We go into a sand section. Now, as the instrument is lowered down into the hole, you realize that the current coming back to the surface is recorded, the instrument is grounded in your slush pit, one electrode there and the other electrode is going into the hole. Well, it shows electrical currents go back up from the bottom to the top. If they have a section of six feet and the instrument is traveling fast it begins to wave those lines and that can be corrected by raising and lowering your instrument, but the rapid moving of those lines and the time element of taking this survey and getting a Schlumberger away from there means so much that the general operator runs it on through the section.

Q. Do you mean to say those logs are carefully and accurately taken?

A. Yes, sir, very carefully and accurately taken, but I am going into the fact of the detail of trying to compute a log that would show a straight edge line is of no practical importance to a practical man in the field. He accepts the Schlumberger so long as it indicates what is in the hole.

Q. You mean these variations on the right don't mean anything?

A. Certainly they mean something.

Q. When do they mean oil and when not, can you explain that?

A. Yes, sir, the fourth curve, or this dotted curve, it extends out as we have indicated here, unquestionably in an oil section. It whips back right here it comes back out and runs off scale into a good oil section and immediately cuts back and is still in a sand. Un-
 220 unquestionably that well has water in it at that depth. Now, with this pull back in from the resistivity side, we trace over on the other side of the log and we see no porosity. It is indicative of a shale section, but as we stay in the true sand sections above and below that immediate shale there, the smaller irregularities on your curve mean nothing about how much saturation you might have in that sand.

Q. Well, now, those variations in the curve there are subject to interpretation by engineers, are they not?

A. Yes, sir.

Q. Would all engineers agree on the interpretation of the curve?

A. In general I believe they would.

Q. Now, I believe you have stated that these charts here are not drawn to scale, and in fact the Schlumberger test will indicate the sand condition at not more than a few feet away from the well?

A. That is correct.

Q. How far is it actually between the Shell Richey No. 36 and the Atlantic Tooke No. 37?

A. About 8000 feet.

Q. About 8000 feet?

A. Yes, sir, I believe that is right. Let me check that, please, counsel.

Q. All right. That is from the Shell Richey to the Atlantic Tooke, isn't it?

A. That is right, 8,000 feet.

Q. While these charts that you have put on
 221 here indicating the sand conditions actually indicate the character only a few feet from the well

bore, you have undertaken on this chart to draw in the shale lenses and so on all of the distance between the Shell Richey No. 36 and the Atlantic Tooke No. 37.

A. That is correct.

Q. You don't have any way of telling that by observation, do you?

A. Not from that cross section there, no, sir.

Q. Are these all of the wells you took into consideration in preparing that chart?

A. That is all of the wells shown on this chart. As I have made this point clear from every red dot that is on the sand thickness map, I have studied the Schlumbergers and have made what I think is a fairly intelligent interpretation of the sand conditions of that field, and I have so indicated that interpretation on my cross section.

Q. Now, the only way of actually finding out how much shale there is and where it is, say, in this area here shown by these three letters B, which is about halfway between the Shelly Richey and the Atlantic Tooke well, would be by putting a well down there and running a Schlumberger on that particular area, would it not?

A. That is correct. I have some additional Schlumbergers that could have been added to this section, but it would have just been a confusion mass of Schlumbergers.

Q. By adding more information you don't confuse things, do you?

A. By addition a section here—a Schlumberger only takes in six feet away from the well, and if you
222 plant one on top of another, one here and one every six inches, if we are going to take an area of seven miles we wouldn't be able to examine the chart or exhibit it to the Court.

Q. That is just your best judgment about the way those shale lenses extend from the Atlantic Tooke to the Shell Richey?

A. I have made an interpretation between these two wells and shown that as a possible indication of that thing. If you are interested in what that is I have additional Schlumbergers that I can place in there and definitely tie that down.

Q. That is your interpretation of the situation there?

A. Yes, sir.

Q. You don't mean to say that that necessarily shows the amount of shale or its location in that particular area?

A. No, I wouldn't guarantee that that sand section indicated here is four feet thick.

Q. Now, here at the location of the Rowan & Nichols well—

A. Yes, sir.

Q. Which you have marked on this chart, your chart shows no shale or volcanic ash or anything of that kind in that area.

A. That is right.

Q. Have you studied the logs of the Rowan & Nichols wells to see whether the actual logs of those wells coincided with your interpretation of the way that sand ought to be?

A. The fact, counsel, if I had depended on Rowan & Nichol's logs they would have shown this identical thing, because the logs showed the type of the sand and oil sand from there to the bottom, but I did not depend on their interpretation and did study additional Schlumberger logs in the area.

Q. Let me call your attention to the log which was filed with the Railroad Commission on the Rowan & Nichols Well No. 2.

A. A or B lease?

Q. On the B lease, the twenty-five acre lease out of the B. C. Todd Survey. I call your attention to the fact that there the well log shows that the oil sand was struck at 3,573 feet and extended four feet to 3,577 and then ashes were struck at 3,577 and went down four feet to 3,581

and then an oil sand was struck. From that point down to the total depth. Wouldn't that indicate that your interpretation was incorrect, at least in so far as that well No. 2 of that lease was concerned?

A. I didn't put this out as an exact to the foot measurement of the cross section, counsel, but to indicate the general condition in there, and as you have indicated here, we have cap rock from seventy two to seventy three. That would be one foot. And then we have ash from seventy seven to eighty one. That is four feet. This is a forty foot to an inch scale, in there, and we could put, if you want to, those two thin lines in there to indicate the irregularity of this cross section.

Q. Now, Mr. Buck, wouldn't that make considerable difference in what you call the amount of recoverable reserves as to whether or not you had a four foot lense in there of ash or shale?

A. Well, may I say this, counsel, if I said or left the impression that every foot of this sand section from the top here to the bottom was represented by oil, a saturated sand, and that I made those computations for the estimation of the reserves under the Rowan & Nichols lease, I am sorry because I did not attack or work on the
224 problem in that manner.

Q. In other words, Mr. Buck, this, to be fair about it, is your best interpretation of it from the information you have as to the sand conditions there, but those sand conditions will vary from well to well and lease to lease, won't they?

A. Oh, yes.

Q. And it is not entirely safe to rely on an interpretation of this kind in order to find out the exact character of sand under any particular lease?

A. I would say this, counsel—

Q. Could you answer my question or do you have to go into it?

A. I am just going to make this statement, if I may, please. In making a calculation or information of reserves and using this cross section, it would be utterly stupid, and I have no intention of doing that with this cross section.

Q. Now, Mr. Buck, going on to another point, here, I believe you have indicated that the original water level was approximately horizontal at a subsea depth of 3,320 feet?

A. Yes, sir.

Q. Now, incidentally, bringing out a point which I think was mentioned, the Woodbine sand doesn't outcrop anywhere near the East Texas oil field, does it?

A. No, sir.

Q. It outcrops back up several hundred miles, does it not, near Dallas? Up in that vicinity?

A. That is correct.

Q. And this water which comes down through the Woodbine sand section and finds its way here to where the Woodbine sand is here eventually ends in the East Texas field?

A. Yes, sir. At one time it was all saturated with water, the entire section.

Q. On that I might bring this out, that conge water you spoke of in that oil section is water which remains in the sand after a good part of the water was displaced by the oil?

A. That is correct.

Q. Now, this water level you say was originally approximately horizontal?

A. Yes, sir.

Q. As oil has been withdrawn from the reservoir the water rises above horizontal?

A. Yes, sir.

Q. The water table rises horizontally?

A. Yes, sir.

Q. It doesn't go at one angle or the other but—

A. I have found this, counsel, in the examination of these logs, instead of the water level being in exact horizontal, in an exact horizontal line, it will or there has been a slight tilt, I have found wells producing water at higher depths, right at the Austin Chalk, while in another part of the field it would be at a lower depth, indicating that instead of it being a horizontal line, there is a slight slope to it, it is coming up to this side.

Q. Now, under any system of withdrawal from the East Texas field, a ratable withdrawal from the East Texas field, the water level will continue to rise approximately horizontal, will it not?

A. That is correct.

226 Q. And that means necessarily, does it not, under any system of regimentation that wells on the west will go out before wells on the east?

A. Yes, sir, they certainly will.

Q. That is true, isn't it?

A. Yes, sir.

Q. Assuming that the same conditions are approximately equal throughout the field?

A. Yes, sir.

Q. Isn't that correct?

A. Yes, sir.

Q. Well, now, do you know the subsea depth of the top of the Woodbine sand in the vicinity of the Rowan & Nichols lease?

A. I can give it to you very easily, sir. Minus 3,180.

Q. Minus 3,180?

A. Yes, sir.

Q. And what is the highest point on top of the Woodbine sand in the field or in the cross section that you have drawn here?

A. The cross section I have drawn here is 31—32—around 3,150 or 3,160.

Q. 3,150 to 3,160?

A. Yes, sir.

Q. What is Rowan & Nichols?

A. 3,280. I believe I said that, or 3,180. 3,180, yes.

Q. Well, now; Rowan & Nichols, is higher—than—the top of the Woodbine sand in the Rowan & Nichols area is higher than the top of the Woodbine sand in the extreme eastern edge of the field, is it not?

A. That automatically makes it lower.

227 Q. What would that difference be?

A. Twenty feet.

Q. Rowan & Nichols—

A. Is twenty feet to thirty feet lower subsea depth than this.

Q. All right. Now, the operation of the East Texas field, as you said, on any ratable basis,—basis of ratable taking would mean that the wells towards the east will go out after the wells to the west?

A. That is correct.

Q. In other words, Rowan & Nichols, under any system would be more favorably situated on that basis from all of the wells to the west of them?

A. Unquestionably you are right.

Q. And they would not be so favorably situated as the wells to the east of them if the sand conditions to the east of them allow free passage of oil and water?

A. That is correct.

Q. Now, Mr. Buck, do you find that the sand conditions to the east of Rowan & Nichols, over here in this area are the same as the sand conditions in the neighborhood of the Rowan & Nichols tract?

A. Counsel, from indications of the map here, you can see the number of Schlumberger logs I have examined in the area surrounding and east of the Rowan & Nichols property, and I might say we were very fortunate in having as much information as this to study because there are some areas of the field where I had a sparsity of informa-

228 tion and data, but in the area west—I mean east of the Rowan & Nichols property I had an opportunity to study a big majority of the Schlumbergers of that area there, and it can be definitely tied down, the actual sand conditions of that area.

Q. Now, please answer my question, do you find the sand conditions to be the same east of the Rowan & Nichols tract as they are in the vicinity of the Rowan & Nichols tract?

A. You mean the same in thickness? You know, counsel, they pinch out to the east and the shale fingers are in there, but we have the same general sand conditions to the east.

Q. Compare the sand in the Rowan & Nichols to the sand to the east. You have pointed out one condition, that the sands to the east are much thinner?

A. Yes.

Q. What about the porosity of the sands to the east?

A. The average would be the same porosity.

Q. Are there variations there? Don't you find tighter sands in the eastern section of the field there than you do find in the Fairway around the Rowan & Nichols tract?

A. We have this big gravel section that comes in here, and the porosity of this thin sand thickness is greater.

Q. Does that condition exist all the way over to the eastern edge of the field?

A. Within an area inside of the—from the twenty foot sand thickness on it does, yes, sir, twenty foot sand thickness eastward it does not.

Q. How much is that?

A. That is an area of about 2000 feet.

Q. You mean a distance of about 2000 feet?

229 A. Yes, sir.

Q. All right, from that point on to Rowan & Nichols you say the sand conditions, so far as porosity are concerned are about the same?

A. Porosity, and permeability. The section thins as you go east, but porosity and permeability are about the same.

Q. What about the character of this sand over here, with reference to whether or not there are more or less lenses of shale and ash and other impervious strata of that kind in there.

A. As I explained, counsel, you take your section from ten feet thickness on back to the Rowan & Nichols property there, although there are some shale fingerings entering into there and the sand thins, permeability, porosity, and saturation of that sand and per cent of actual sand saturation to the percent of total Woodbine section is uniform and constant.

Q. Now, in determining the amount of recoverable oil in that part of the field, that is east of the Rowan & Nichols, are you not only taking into consideration in those factors you have already described, but you also take into consideration pressure, do you not?

A. Pressure for recoverable oil?

Q. Yes, sir.

A. Yes, sir, that would be a factor.

Q. Well, that is what I asked. Now, do you find high pressures over on the east side of the field, or do you find very low pressures over on the east side of the field?

A. The areas of low pressure are all more or less confined to the east, north and south ends of the field.

Q. Now, in other words, the area which is east
230 of the Rowan & Nichols lease, generally has considerably lower pressure than the areas in the vicinity of the Rowan & Nichols lease?

A. No, not considerably lower pressure. In the Glade-water section, the sand—I mean the pressure gradient is very slight compared to the pressure gradient in other portions of the field, but there is a lower pressure to the east than there is at the Rowan & Nichols tract.

Q. Doesn't that mean that to the east of the Rowan & Nichols there is a smaller per cent of the recoverable oil to the east of the Rowan & Nichols tract, than there is on the Rowan & Nichols tract?

A. In place that is true. Under the present method of production it is 100 per cent wrong.

Q. We are now talking about conditions under the present system of operation.

A. All right.

Q. And under the present system of operation the pressures on the eastern side of the field, generally, are much lower than the pressures in the Fairway, are they not?

A. That is correct.

Q. And there are a great many pumping wells at the present time over on the eastern side of the field, are there not?

A. Yes, sir.

Q. Doesn't that mean the wells on the eastern side of the field are going out of production before the wells in the Fairway will go out of production?

A. Not at the present method of operation, it
231 does not mean that.

Q. You don't think that by reason of the fact wells go on the pump on the eastern side of the field and some are abandoned and pressures are lower over there, that those wells over there will go out before the wells in the Fairway will go out?

A. Counsel, I will explain again that the area of ten foot to twenty foot Woodbine section and westward are all connected together and these wells, even though the pressure in them is such that they have to be pumped today, will be pumping and producing oil considerably longer than Rowan & Nichols will ever produce oil. The wells on to the east of that will be gone and forgotten many years prior to the time the water floods out Rowan & Nichols property.

Q. Well, then, you concede that there is a certain portion of the field which is east of the Rowan & Nichols which would go out of production before Rowan & Nichols?

A. Yes, sir, there is quite a band of production to the east that that will happen to.

Q. Now, how much, how far do you say that extends to the westward from the eastern edge of the thickness?

A. By indicating on this sand thickness map a midpoint, the ten to twenty foot sand thickness, areas east and west of that going out and areas west will continue to produce.

Q. The sections you have taken east and west of about through the Rowan & Nichols lease, that portion of the eastern part of the field, that will go out of production before the Rowan & Nichols lease, and that is about 2000 feet wide?

A. Yes, sir.

Q. And does it or not get wider as you go
232 down north and south on that point?

A. In some instances it does and in some instances it changes. We are talking about a cross section line through the Rowan & Nichols lease in the Joinerville area. Unquestionably this area will be 3,000 or 3,500 feet wide. In the Kilgore area, it perhaps will be only about 1500 or a thousand or eight hundred feet wide. That depends on the sand as it pinches out against the Austin Chalk.

(At this point a recess was taken until two o'clock, of the same day, at which time the following proceedings were had):

Cross Examination (Resumed)

Questions by Mr. Hart:

Q. Mr. Buck, I would like to direct your attention to this chart again, please, sir.

A. Yes, sir.

Q. Your attention to this chart again, please, sir.

A. Yes, sir.

Q. Did I understand you correctly to the effect that as oil is withdrawn from the reservoir under the present plan of allocation the water level will rise almost horizontal or will it tilt somewhat?

A. I made this explanation, that in studying the Schlumberger logs I have found the tendency of the water is to rise a little higher than level at the contact point.

Q. In other words, it would rise more this way than it would this way, is that correct?

A. Yes, sir.

233

Q. And I believe you stated, I want to direct your attention to that portion of your testimony that under the present system of withdrawal or any system of ratable withdrawals the water level would rise so that the wells on the west generally would go out of production before the wells on the east, assuming the sand is practically uniform?

A. That was my testimony, yes.

Q. Then, the wells to the east have an advantage by reason of their structural position, do they not?

A. Decidedly so.

Q. And that advantage existed there in the field before it was ever developed, didn't it?

A. Yes; sir.

Q. Now, would that same advantage by reason of the position on the structure, exist, and assuming that the field was fairly uniformly drilled, would that same advantage exist by reason of position on the structure if there was an unlimited production of oil from both wells, that is an unrestricted or open flow production?

A. In some instances yes, and in some instances no.

Q. Now, I am assuming that the field is fairly uniformly drilled?

A. Yes, sir.

Q. And you say it would not, that the same structural advantage would not exist?

A. That is correct, it would not under wide open flow.

Q. Just explain in what instances the structural advantage would not exist under wide open flow?

A. The area immediately to the east and further removed from the source of energy or water drive and having a thin sand section, under open flow conditions would not flow as long nor recover as much oil because of the rapidly decreasing pressure, and the area in the center or area of thick sand would have a structural advantage under that type of flow.

Q. Apparently the thickest sands are somewhat west of the Rowan & Nichols tract, are they not?

A. That is right, right in that vicinity from the point of contact of the water here to the top of the Woodbine section, that is the area of maximum thickness, slightly to the west of Rowan & Nichols.

Q. In other words, you would move the area of that maximum thickness, maximum recoverability, somewhat east of this point that you have shown by your red line here on this map, Exhibit No. 10?

A. Yes, I did that when I opened the field wide open, that line of zero—zero line of maximum recovery would not be in that place there.

Q. Where would the zone of maximum recovery be on open flow?

A. In the thickest sand section.

Q. What?

A. In the area of thickest sand section, which would be slightly west of the Rowan & Nichols lease and on to the south in one or two places where the sand thickness is eighty feet or thicker.

Q. Would you say the wells on the east of the
 235 center of the field there would not have any structural advantage under open flow conditions?

A. They would have a slight advantage, but not near in proportion to what they have now.

Q. Now, in determining recoverable reserves, do you take into consideration the position on structure?

A. Yes, sir.

Q. Now, Mr. Buck, on this map here you show that the water level has risen some distance from its original level of about 3,320 feet subsea.

A. Yes, sir.

Q. About where is that water level at this time?

A. As indicated in the Shell Richey No. 36, the water level is approximately minus 3,310 feet.

Q. In other words, the water level has risen in the reservoir about ten feet in about eight years?

A. That is indicated by this Shell Richey well, it has risen at least ten feet in the Shell Richey—in some places not that much and in some other places considerably more.

Q. You don't mean to say, then, that this level of minus 3,310 shows the exact water level? Some places it is higher than that on the structure and some places a good deal lower?

A. That is correct. The only graphic demonstration you could make of that and show the advance of water on the field is like a sketch here, but I did not mean to infer that the water level was flat and straight ten feet above the original water level.

Q. How much variation would you say occurred between different tracts as to the height
 236 of the water?

A. We have evidence, as indicated on this water map, of wells producing water at minus 3,285 feet and others still producing oil at minus 3,320. That would be about thirty-five foot fluctuation in that level.

Q. Fluctuation in the water level?

A. Yes, sir.

Q. And you can't tell exactly where the water level is in any tract unless you drill into the water sand, can you, unless you have a well already drilled into the water sand and test it by Schlumberger or some other way?

A. Well.

Q. If you have a well already drilled into water you can test that in various ways and find out about the water level, what the water level is at that well?

A. Yes, sir.

Q. Now, will this water level rise at approximately the same rate as you would withdraw more oil from the reservoir, under the present plan of allocation?

A. No, as this water level advances up the Georgetown and the field is confined into a narrower area the water rise would be faster.

Q. Well, how much faster would it be, do you know?

A. It would be just a calculation there, the difference in volumes.

Q. Well, you have approximately the same volume as your water level rises, it would take about the same volume, wouldn't it, because the top of the Woodbine pinches off here as it precedes out this way?

A. Yes, but those volumes are not consistent.
237 and after the water approached to a point where the Richey well was drowned out the water advance would be very rapid.

Q. Could you tell me what the rate of rise of water would be at the present rate of withdrawal?

A. No, sir.

Q. Now, before the Rowan & Nichols lease would be drowned out there, all of it, there would have to be a rise in the water level from 3,310 minus up to minus 3,180, a rise of 130 feet in water level will there not?

A. The water level, it would take a rise of 150 feet to put the water there.

Q. Would it be 3,180 from 3,310?

A. Yes, sir.

Q. Making 130?

A. Yes, sir, 130 feet of rise. Yes, 130 feet.

Q. All right.

A. But the Rowan & Nichols well would not be, of course, producing until the last foot of that sand is drowned out.

Q. Well, how many feet of sand would it have to have there and still produce?

A. That would be dependent entirely upon what the mechanical conditions were that developed in the well. Some you could continue to produce up to six inches and some would be flooded out at ten feet.

Q. Assume ten feet; in eight years the water level has risen ten feet?

A. Yes, sir.

Q. To rise an additional 120 feet, how long
238 would it take to rise 120 feet at the same rate of rise and assuming the same production?

A. We can't make those two assumptions, they are not the same.

Q. Aren't you willing to answer my question?

A. No, sir, those two assumptions are not the same, counsel.

Q. Just a minute, sir, and if you can't answer my question say so, but isn't it—assume the same rate of withdrawal?

A. Yes, sir.

Q. Assume the same rate of rise?

A. Yes, sir.

Q. How long would it take for the water level to rise up to a point where there would still be ten feet of oil sand in the Rowan & Nichols well?

A. I can't answer.

Q. You can't even answer that, making those assumptions?

A. No, sir, the two assumptions are crossed, you have to assume either one or the other, but those are contrary.

Q. If there was the same rate of rise and withdrawal it would take about how long?

A. We have had, if it is as you have stated, eight years and ten feet.

Q. All right.

A. So that would be, I believe we figured 130 feet, was it not?

Q. Yes, sir.

A. It would be twenty-five years or something like that.

Q. How much?

A. Two hundred years. I don't know. I can figure it for you.

Q. Go ahead and figure it.

A. I believe your problem is a rise of ten feet every eight years, is that correct?

Q. Yes, sir, that is correct. Ninety-six years, wouldn't it?

A. Yes, sir.

The Court:

Do you think that is helpful to put that in?

Mr. Hart:

Yes, sir, I think it is.

The Court:

I think it is very remote.

Mr. Hart:

I think it is because I think the oil will be produced long before their recoverable oil will be produced long before their wells will be drowned out. As I understand it, their contention has been that their wells will

be drowned out long before they can get their recoverable oil.

The Court:

Of course, I want to let you interrogate this witness as fully as you want to, but this is like all of these oil cases. The expert and the lawyers know so much about it that they can talk about it indefinitely; whereas in the last analysis, when the Court comes to decide it, he has to get it down to a narrow point, and you all scatter it around a great deal. It doesn't give me any help, I know. It may be of some help to the Appellate Court, but I doubt it. What is the use of speculating on what is going to happen a hundred years from now?

Mr. Hart:

It is offered for the purpose, if the Court please, of showing that the estimates they have made of the time they have left to produce, are inaccurate.

240 The Court:

All right, go ahead.

Q. Of course, Mr. Buck, as the water levels rose, the wells here along the western edge of the field would go out of production, wouldn't they?

A. Yes.

Q. And if you kept the same allowable for the field the total withdrawal would decrease?

A. Yes, sir.

Q. And also it would follow, would it not, Mr. Buck, that if instead of keeping the same allowable for the well you kept the same total allowable for the field, as the wells on the west were forced to close down by reason of encroachment of the water, there would be a greater allowable for the remainder of the wells.

A. Yes, sir.

Q. That would follow, of course?

A. Yes, sir.

Q. Now, do you know what the pressure in the neighborhood, the bottom hole pressure, in the neighborhood of the Rowan & Nichols sand was at the time this pro-rata order went into effect in April of 1933?

A. No, sir, I do not know.

Q. Well, in order to refresh your memory, I will ask you if it wasn't about 1200 pounds?

A. Yes, sir, I believe it was in the neighborhood of about 1200 pounds, possibly just a little above 1200 pounds.

Q. At the present time what is the bottom
241 hole pressure in the vicinity of the Rowan & Nichols lease?

A. I understand it is around 1,228 pounds, but I wouldn't say for sure.

Q. You don't mean 1,228?

A. I mean 1,128 pounds.

Q. That has been a reduction of about how much, then?

A. About seventy pounds, in the neighborhood of sixty-five to seventy pounds.

Q. At the present rate of withdrawal the bottom hole pressure in the field is decreasing at approximately what rate per year, then?

A. I don't know the decrease per year. It is my understanding that the decrease is around from three-tenths to five-tenths of a pound per million barrels of oil produced.

Q. Well, it averages up on production per year in the neighborhood of the Rowan & Nichols lease of something like eight pounds, does it not?

A. That I couldn't say. I will accept your figures on that.

Q. Well, about what pressure would their lease have to be reduced to before they could get out of their wells

twenty barrels a day—before they could not get out of their wells as much as twenty barrels a day?

A. That would depend entirely upon whether there was water in the wells or not. If there was water in the wells, Mr. Hart, the pressure could be 1500 pounds and they would not be able to get twenty barrels out of them.

Q. Assuming no water.

A. With no water they possibly could produce below 500, or 300 or 200 and still be able to get twenty barrels.

Q. At the present fall in bottom hole pressure by reason of the present proration, that maintains the bottom hole pressure at almost what it was when the method went into effect, it would take a long period of years before the pressure on the Rowan & Nichols tract or in that neighborhood would be so low they couldn't flow the wells, isn't that correct?

A. At the present rate of decline that is true.

Q. It would be a considerably longer period of time than the time that has been estimated in this schedule that was handed to the Court showing the time it would take Rowan & Nichols to withdraw their part?

A. Yes, sir, but the point about that, Mr. Hart, the data that was used to calculate that schedule and the assumption you are making about the water level and pressure are way two different things.

Q. Did you make this schedule here, Mr. Buck?

A. I beg pardon.

Q. Did you make this schedule which was handed to the Court when Mr. Rowan was on the stand?

A. May I see it, please? I made one and checked another. I don't know which one you have there. Yes, I made the calculation for that.

Q. Now, in making the calculations on this schedule of the number of days it would take to recover all of the oil in the field with the present daily allowable, you

assumed all of the wells would continue to produce their present amount until the oil was gone, didn't you?

A. No, sir.

243 Q. Didn't you just divide the number, the amount of the total reserves by the daily allowable and just see how long that would take it?

A. Yes, sir, but that is different from dividing it by the number of wells. I assume there a constant rate of extraction, not a constant number of wells.

Q. As these wells on the west went out the Rowan & Nichols allowable would be increased all the time, wouldn't it?

A. That is right.

Q. In calculating the number of years Rowan & Nichols would take to get their oil you assumed the same daily allowable from there on, didn't you?

A. Yes, sir.

Q. That wouldn't be true, Rowan & Nichols would get a higher allowable as the wells on the west side went on?

A. Some higher allowable, that is true.

Q. So it wouldn't take as long to get their production out as it shows on this schedule to produce their oil?

A. Perhaps not.

Q. That is correct, is it not?

A. That is correct.

Q. Now, Mr. Buck, you have been talking about the pressure here. The only use that pressure has in oil fields is to aid in getting the oil into the well bore and pulling it up to the top of the well, isn't that true?

A. No, sir.

244 Q. Well, what is the use of drilling an oil well unless it is to get oil to the surface of the ground?

A. There is none.

Q. Pressure is useful in doing that in that it forces oil into the well bore and up to the top?

A. That is correct.

Q. Now, if you cut down the minimum allowable of the wells to the point where that pressure will not force the oil up to the surface, you are making—you are thereby depriving the owners of the land on which that occurs of the use of that pressure in getting oil out of the ground, are you not?

A. Counsel, those two things don't follow again. Now, the two assumptions are crossed, are contrary again.

Q. Answer my question, please, Mr. Buck.

A. I cannot answer that, sir.

Q. You cannot answer that?

A. No, sir.

Q. Wouldn't you say that if you produced a condition in the wells where the pressure would not be sufficient to force the oil to the surface that thereby you are depriving the owners of those tracts of the use of the pressure which they could use if they were not restricted in their production?

A. I believe now that I understand a point of your question there. You mean that if production is curtailed to such a point as the column of fluid would accumulate in the well and could not be lifted by the pressure would not the operator then be deprived of his pressure. Is that the question?

Q. I didn't mean—no, I didn't ask you if he
245 would be deprived of his pressure, I asked you if he would be deprived of any use of his pressure in getting his oil to the surface?

A. He would be deprived of the use of that pressure in getting the oil to the surface.

Q. And I don't think you gave us this morning, and I don't know whether you said whether you could or not, an estimate of the minimum that you could cut wells down to without causing the loss of the use of that pressure?

A. No, it is impossible, counsel, for me to give you that as a blank statement.

Q. Could you give me an average for the east Texas field?

A. An average?

Q. Yes, sir.

A. Yes, I believe I could give you an average.

Q. Of what would that be?

A. Daily extraction, producing the well every day?

Q. Yes.

A. Between fifteen and say seventeen and a half barrels, that would be a striking average on it.

Q. When you take into consideration the Saturday and Sunday shutdowns in the East Texas field, you are actually allowing this well only about fourteen barrels per day, are you not?

A. Yes, sir, that is correct.

Q. And, according to your testimony, then, on the average of the field, if you cut them down to below say fifteen to seventeen barrels a day on an average, you would produce that condition you have spoken of?

246 A. If you were required to produce them every day that is true, that condition would be happening in the field now if you were required to produce every day, but you have two days shut down time in there. What is the difference between two days shut down time and five days shut down time so long as you take enough well out of that oil to keep a live column in your tubing?

Q. You mean it would be better to operate the field once a week rather than five days out of the week?

A. I didn't say that.

Q. You mean the contrary, it would be better to operate it every day in the week?

A. That is correct.

Q. And on an average of from fifteen to seventeen barrels a day?

A. I did not say that.

Q. Please explain that.

A. I would like to make this statement, that I believe that the East Texas field should be produced at a rate not to exceed 400,000 barrels a day.

Q. All right.

A. And I believe further that that allowable could be distributed amongst the wells over there in such a manner that that 400,000 barrels daily production could be taken out of the field without causing waste.

Q. All right. Now, I believe that is on a different point than I was asking you about. Now, talking about this fifteen or seventeen barrels a day.

A. How many wells do we want, 25,910 wells?

247 Now if each of those was allowed fifteen barrels a day, we are above what I consider the maximum efficient rate for the reservoir, but if you want to give each well this fifteen or seventeen or twenty barrels a day and get above the 400,000 I believe more waste would occur on a seven day week program than is now occurring on a five, and would be less if it were produced on a three.

Q. Would it be still less on one, one day per week?

A. Possibly it would.

Q. I don't understand, Mr. Buck, how you can reconcile your statement that keeping the oil in that column there deprives the well owner of the use of that pressure with your statement that you ought to produce the well just one day a week.

A. Well, you apparently don't understand the condition there and you have asked me the question twice with two assumptions that were conflicting. Now, I may be able to explain. In taking oil out of a well at five or three or anything under fifteen barrels a day, over a few days or weeks time, dead oil will accumulate in that well under an average daily pull there, and the well would have to resort to some means of arti-

ficial lifting to get the oil out of there. That is one part of the question. All right, now, the pressure in the field, with the exception of one or two isolated areas is not sufficient to lift that column of oil out of the tubing. Now, if we have a field allowable, a top field allowable that has to be distributed amongst the wells that you have given me of 25,910 we have already cut this thing to fourteen barrels per day by having two days shut down.

Q. That is right.

A. All right. Now, if we are to continue on 248 and reduce it below this fourteen barrels, it necessarily follows you would have to have four shut down days.

Q. All right, sir, I think I understand it now. You say that you believe about a four hundred thousand dollar—four hundred thousand barrel top allowable is the proper total allowable in the East Texas field?

A. I believe that would be a maximum, yes.

Q. By maintaining the pressure you cause a larger recovery from the whole field, do you not?

A. That is correct.

Q. And assuming that a man's lease is drilled to the average density of the field or better a man under this system of allocation will get more accurate recovery out of his lease under this system than he would under open flow conditions?

A. Oh, no, you could have through a cross section of the field 500 examples to the contrary of the statement you have made and then other examples that would conform right with it under wide open flow.

Q. Do you mean that because of the density of drilling around the—

A. No, I am not meaning the density of drilling at all, I am assuming equal spacing and making that statement. If you are going to then go to uneven spacing it is even more out of proportion.

Q. Well, then, on some tracts you would get more recovery and on others you would get as much ultimate recovery as you would get under open flow conditions?

A. I can state this, if it be in answer to your
249 question, that on the extreme west side of the field, under open flow for the whole field, the western one-fourth of that field would not recover as much as it would under regulated withdrawals. There are other portions of that field that would recover more under wide open flow than they would under regulation, and there are others to the east side of that field that would recover considerably less under wide open flow than they would under regulated control. You have a field here that is from four to thirteen miles wide and it depends upon the structural position there whether we are going to assume whether we have wide open conditions or regulated control conditions.

Q. Under the present system of proration you would get a larger total recovery from the field?

A. Yes, sir.

Q. Now, as to the Rowan & Nichols tract under the present system of proration, will he or not get a greater total of recovery from the tract than he would under open flow conditions?

A. He would not.

Q. How much less would he get?

Mr. Moody:

Wait a minute. I don't understand that "he would not" answer to the question.

A. He would not recover as much under regulated withdrawals as he would under wide open withdrawals.

Q. Would he recover more of the oil while the wells were flowing under the present situation than he would under open flow conditions?

250 A. I believe that his flow period there or recovery of flow would give him more barrels under wide open conditions than it will under the present plan of regulated control.

Q. Now, Mr. Buck, what do you mean by the recoverable reserves under a tract?

A. That is how much oil he will get between now and the time that the property will be abandoned.

Q. Do you restrict that to the oil that he will recover that is directly under his tract?

A. No, sir, that is the amount of oil that he will reduce to possession in his tank, wherever it might come from.

Q. Well, now, do you mean in figuring on the recoverable oil from the Rowan & Nichols tract, you figure oil that will migrate to his tract from the tracts to the west?

A. That is correct, that all had to be taken into consideration, counsel.

Q. Well, what about the boys on the west there in figuring their recoverable oil, would you figure their recoverable oil—would you figure the oil they had in place less what they are going to lose by migration to the east?

A. No, you are talking about recoverable oil and migration, they are not the same.

Q. I asked you in figuring the recoverable oil under the tract on the western edge of the field, would you take the oil which they had in place and take from that the oil they would lose by migration to other wells to the east of them?

A. You don't need to make that subtraction, the subtraction is what they had in place to what they recover. The balance or other part is what moves upstructure.

251 We are dealing with the recoverable oil and oil he produces in his tank off of the ground, whether he has one barrel per acre or one hundred thousand barrels per acre in place.

Q. In considering the recoverable reserves in the Rowan & Nichols tract you not only consider the oil under his place and the physical characteristics, but you also figure the oil he will gain by reason of oil being forced to his tract from tracts on the west, is that correct?

A. It is not a question of gain, it is a question of loss from his structural position.

Q. Would you just answer me, please? Do you consider the amount of oil that is driven to his tract from the west in determining his recoverable reserves?

A. I can't consider it because I don't know how much there is there. I can give it to you in time or in barrels or in recovery, but not in the amount of oil that is passing under his tract, I can't give you that answer.

Q. Well, as I understood you, Mr. Buck, you stated that you don't consider just the oil in place under the tract and then determine what percentage of that is recoverable, but you take into consideration the oil that he will acquire from some other place in determining what his recoverable reserves are.

A. I think my testimony on that is quite different from the way that you have stated it, counsel.

Q. Well, then, please tell me what you do consider in determining what the recoverable reserves under a tract are.

A. The recoverable reserves under a tract in the East Texas field depends upon first the amount of oil that he might have in place, the structural position of that oil.

Q. Now, just a minute, please. Now, what
252 do you mean by structural position? You mean if he is on the east he would probably get some more oil in addition to the oil in place under his tract?

A. It could be that.

Q. All right, you think that that ought to be taken into consideration in determining the recoverable reserves of a tract?

A. It unquestionably has to under this plan of operation in the East Texas field.

Q. Well, then, these people over here to the east of Rowan & Nichols that may have a little less sand thickness but are to the east of him, because of their structural position, you would say they had a larger recoverable reserve than he?

A. Yes, sir, that is the very point.

Q. Then there is nothing inequitable in them producing longer than Rowan & Nichols?

A. Sir?

Q. Because of the natural advantage they have by reason of the location in the field, there is nothing inequitable in their producing longer than Rowan & Nichols produces?

A. I don't see—I don't quite understand the question. I beg your pardon. If you would state it once more, please.

Q. I think the question is pretty plain.

A. Will you get the Reporter to read it back to me, please?

(Question read.)

Mr. Moody:

That calls for a question of law. I think that question calls on the witness to express an opinion of law.

253 The Court:

I think it is an argument.

Mr. Moody:

And, an argument.

Q. All right, sir. Now, you say you take the oil in place, that is the cubical content of the area within the oil saturated sand under his tract, you take that into

consideration in determining his reserves. Now is that correct?

A. The oil in place or—yes.

Q. Then, you take into consideration the structural advantage?

A. The structural position.

Q. The structural position?

A. Yes, sir.

Q. And if a person is farther east from Rowan & Nichols he would have more advantage by reason of his structural position than he would if he was located west of Rowan & Nichols?

A. At the present time by this proration he does have.

Q. Did you take that into consideration when you made your estimate of the amount of recoverable reserves that Rowan & Nichols had?

A. Yes, sir.

Q. You took that into consideration?

A. Yes, sir, I did.

Q. Now, Rowan & Nichols had a certain amount of oil you figured in place there, I believe, and they have drawn out 355,254 barrels. How many barrels of oil do they now have in place under their tract?

A. The first figure was one million five—

Q. 1,056,422 and we have withdrawn 355,254. Now, my question is—

A. They have—

Q. Let me ask the question. My question is
254 how many barrels of recoverable oil do they now have in place under their tract?

A. Well, I thought the first question was how much did they have now in place, and now you are asking me, recoverable oil. Their recoverable oil figure is what is on that schedule. The oil in place is approximately the same as what it was to start with.

Q. The oil in place now is approximately the amount that they had when they started out?

A. Yes.

Q. When they first drilled their well?

A. That is correct.

Q. Then, if you consider only the oil in place under their tract they would now have under their tract approximately the same amount of recoverable oil that they had at the time they drilled their first well?

A. No, sir.

Q. All right, sir, to what extent has the amount of recoverable oil under their tract been reduced to this time?

A. The amount of recoverable oil under their tract has been reduced by whatever proportion that they have taken out of there and the field has been depleted. The field has been depleted a certain per cent and Rowan & Nichols' properties have been depleted a certain extent, although they have probably the same amount of oil they had in place in the beginning, they are not going to have an opportunity to recover that oil under any sort of a regulated proration plan in the East Texas field.

Q. Well, they have gotten about twenty-five
255 per cent of the oil in about eight years, haven't they?

A. Yes, sir.

Q. And when we figured at the rate at which the water level was rising or bottom hole pressure decreasing one was forty years and one was about a hundred years that it would run out?

A. You figured that.

Q. Were my figures incorrect?

A. Not with the assumptions you made. Your assumptions were incorrect, sir.

Q. Now, at the present pressures which exist under their lease can they still flow their wells?

A. Yes, sir, they are flowing today.

Q. And how long will it be before those wells will be,—will those wells continue to flow under the present rate of withdrawal, how long will they continue to flow?

A. That I couldn't tell you. Maybe in excess of ten years. I don't know.

Q. You don't know how long it will be?

A. No, sir.

Q. Now, Mr. Buck, you testified that there are certain factors that you take into consideration in determining the amount of recoverable reserves under a tract and, you mentioned first of all the cubical content. Now, is the cubical content, the cubical content of any lease something that can be computed with accuracy, the cubical content of the oil sands under a lease?

A. Now, by accuracy do you mean to a
256 mathematical accuracy of one foot or to an accuracy to which we work and do business on?

Q. About what variation would you have on that or what amount of error would you have in figuring the cubical content of oil sands under a lease?

A. I think with the information we have available now, that whatever error that might enter into the calculations, whether it be five per cent or twenty-five per cent would be a uniform error over the entire calculation for every tract in the field. That is the only way that I could answer that question, counsel.

Q. Well, you might have an error of from five to twenty-five per cent in determining the cubical content of your lease, is that correct?

A. Of anyone's lease, but whatever calculation or base of calculation that you made that error on would be the same, the error would be consistent whether it be high or low, for the rest of the tracts.

Q. Well, now, let's examine that a minute. You might make a mistake in favor of one man, of twenty-five per cent and against another of twenty-five per cent?

A. No, it is not a cumulative error.

Q. Sand varies in thickness according to the top of the sand and the bottom of the sand and the amount of shale in it and all those things, does it not?

A. That is correct.

Q. And if you strike an average you might do one man a twenty-five per cent injustice and another man you might favor him as much as twenty-five per cent, might you not?

A. I don't see how that could come into the
257 calculation at all.

Q. You mean to say that you wouldn't have any error between tracts at all in calculating the amount of cubical content there?

A. It is possible there would be some error. The point I am trying to make is whatever error you made in cubical content of one tract would be a compensating error and that if you took the average figures which I have given you then whatever error existed in one calculation would be a consistent error throughout the west or east of them, whether for or against.

Q. If you go to averages you do one man an injustice and you are giving another man more than he is entitled to?

A. Possibly so, yes, sir.

Q. According to what you have said you ought to try to give a man a recovery according to the reserves under his lease?

A. Yes, sir.

Q. In considering this one factor alone tracts vary considerably by tract to tract and there might be as much as a twenty-five per cent error in this cubical content?

A. No, sir, that would be impossible from tract to tract, from one end of the field to the other you could have a variance of twenty-five per cent, but not from tract to tract.

Q. Now, after you have determined that cubical content there his porosity is one of the things that you will take into consideration in making that man this mathematical calculation?

A. Yes, sir.

Q. You spoke yesterday—yesterday you gave an example of basket balls and BB shot, I believe?

A. Yes, sir.

Q. Now, the amount of porosity between
258 those spheres, either basket balls or BB shot, would depend on how they are packed, wouldn't it? The porosity wouldn't be always the same?

A. I believe—

Q. Just a minute. You made the statement one room would be full of BB shot and one of basket balls. Wouldn't that porosity depend on how the balls were packed? Whether they were packed cubically, that is, the diameter of one ball directly on the diameter of another or packed fifty per cent off their diameters?

A. Yes, sir, if you arrange them the same, they would have the same porosity.

Q. Assuming the same number of balls or spheres in the room, you would get a variation in porosity from forty-three per cent down to twenty-eight per cent, wouldn't you?

A. No, sir.

Q. Have you made those calculations?

A. I know it is impossible, counsel, for it to vary it from forty-three per cent to twenty-five per cent under the situation you have given me.

Q. Well, assuming that—do you or not say that the method in which they were packed would have any difference, make any difference in the amount of porosity?

A. Unquestionably so.

Q. And what would the variation be in the amount of porosity that would enter into your calculation?

A. On these two spherical conditions you have given me there I couldn't answer.

259 Mr. Moody:

May it please the Court, that illustration that was just used to show what was meant by porosity and permeability, and I think it is immaterial whether it is more or less porosity, depending on whether you stacked one on top of the other or stacked them like corn in a bin.

Mr. Pollard:

Our purpose is that by different arrangement of packing of balls, just as it is true in sand grains of different horizons, there would be a difference in porosity.

The Court:

I think you are going into too much minuteness.

Q. Now, what is the variation in the porosity in the East Texas sand?

A. The porosity determinations that I have seen vary from around fifteen per cent to as high as thirty-three per cent.

Q. Fifteen per cent to thirty-three per cent?

A. Yes, sir.

Q. All right, sir, have you ever known of greater variations than that or is that just a sort of average variation?

A. No, sir, that is the maximum and minimum variations of porosity that I have seen in the East Texas field.

Q. You know to what per cent—what per cent of saturation from connate water do you find in the East Texas sand? Do you find any variation in that?

A. I have not found any. I don't have the connate water percentage taken from every core over there. I have found that some connate water percentages, which were taken right at the oil-water contact and immediately below it ran of course as high as ninety to ninety-

five per cent water and five to ten per cent oil,
 260 but when you get into the oil structure, you
 have a fairly consistent connate water percentage of around twenty-one per cent.

Q. Well, sir, now what shrinkage factor do you allow?

A. I allow sixteen per cent.

Q. Do you allow that same shrinkage factor, would that apply all over the field or not?

A. I have so applied it.

Q. Do you think that would be accurate?

A. I think this, that whatever the shrinkage factor is, whether sixteen per cent or twenty per cent, that shrinkage factor is consistent for that type of crude oil.

Q. But the oil is under varying pressures in the reservoir, isn't it?

A. That is right.

Q. So that your estimate would not be exactly accurate?

A. It would, sir, if you get the shrinkage in the reservoir before you get it to the surface your shrinkage will drop from 725 cubic feet to the barrel in solution to a barrel of dead oil without any gas in it on the surface, that is the same.

Q. Those factors I have named, cubical content, the porosity, the pore space, the shrinkage factor—what percentage of permeability, what is the variation of permeability in the East Texas sand?

A. That varies from somewhere in the neighborhood of around 425 to as high as 3,000 millidarcys.

Q. Now, have you named over all of the
 261 factors that you are taking into consideration in calculating the recoverable reserve?

A. No, I have placed one other correcting factor in my formula.

Q. What is that?

A. That is a recovery factor of seventy-five per cent of the cubical content.

Q. Don't estimates of competent engineers vary that recovery factor from say forty per cent up to what you are giving it, say seventy-five per cent?

A. I think—in fact, I have seen recovery factors that varied all the way from forty-five per cent to one hundred per cent.

Q. Would the recovery factors vary from lease to lease or would you give a constant recovery factor for all over the field?

A. I gave a constant recovery factor for the East Texas field and made calculations for the estimated recoverable oil for the field and I used the same recovery factor for the Rowan & Nichols lease. Now, you are correct, counsel, that in some leases the recovery factor would be greater and in other leases the recovery factor would be less.

Q. In other words, in order to fairly ascertain the recoverable reserves you would have to vary that recoverable factor from lease to lease?

A. That is correct. Not from lease to lease, but from segment of the field to segment of the field.

Q. In other words, all of those elements you have taken into consideration in calculating the recoverable reserves under a tract are variables and subject to errors within the limits that you have indicated?

A. They are variables, particularly variable
262 under a per well method of allocation. They are variables and subject to error in any type, but surely under the present method of allocation over there, they are subject to more error than they would be under a better or different type.

Q. Please answer my question. I don't want to take too long in examining you.

A. Excuse me, sir.

Q. Now, all of those factors are taken into consideration in determining the amount of recoverable oil under a tract, and by that you mean the amount of oil that will be brought to the surface of the ground, is that correct?

A. Yes, sir.

Q. Do you also have to consider in that, rate of withdrawal?

A. Oh, yes.

Q. You are assuming a constant rate of withdrawal? Is that correct?

A. That is correct.

Q. Now, are any of those factors which you say could properly be taken into consideration in determining the recoverable reserves under a tract of land reflected by the potentials or by the potential test?

A. I cannot think of any of those factors that would be reflected by that potential test.

Q. Let's look, Mr. Buck, at these two exhibits up here. The one up here in the upper left hand corner and the one in the lower right hand corner. I believe that is the sand thickness map?

A. Yes, sir.

263 Q. Would you say that there is any relation of any kind between the potential contours and the contours showing the sand thickness in the East Texas field?

A. Yes, sir, there is a very definite relationship there.

Q. Very definite and marked relationship, is there not, between the potential contours and the sand thickness contours?

A. Yes, sir.

Q. In other words, where you have a thick sand, you also have a high potential, don't you?

A. No, where you have a thick sand you have a key well that you took a potential on.

Q. All right, let's sit down. When you were there working for the railroad commission, when their first potential tests were made—

A. I was not working for the Railroad Commission at that time, but the commission had borrowed me back from the people I was working for and I was up there at the time and helped select the wells and talked to the operators for getting the selection of them, but I was not on the payroll of the State of Texas.

Q. Was that when the tests were made, while the whole field was shut down?

A. Yes, sir.

Q. And what time were those tests made?

A. Going from memory it must have been from maybe the tenth or twelfth of April or it might have been as late as the seventeenth of April of 1933 to the end of April. I just remember it was in there. It seems like it was a ten day or twelve day shut down. I don't re-

member just now how long the field was shut
264 in or how long it took us to complete the tests.

I know I was in the field better than fifteen days, on the assignment.

Q. Is that the only potential you helped take?

A. Yes, sir.

Q. There have been other potential tests taken since then, haven't there, Mr. Buck?

A. There have been other wells tested, and I believe another potential test was made, maybe for testing all of the wells, but I don't believe the field was ever shut down entirely again to take a potential test.

Q. In 1935 the key wells were selected and another potential test made on which that potential map is based, was it not?

A. I so understand.

Q. Now, in selecting the wells the commission picked out wells which are scattered throughout all sections of the field, did it not?

A. No, sir.

Q. Aren't these wells scattered pretty much from the eastern to the western side and from the northern to the southern, all over the field?

A. They are scattered through an area of sand thickness of thirty feet or better in practically every instance in the East Texas field.

Q. Well, you got dry holes on the edges to determine the outer limits of the field?

A. Oh, yes.

Q. And you say they began about thirty feet or better and went in?

A. I say some of them are as low as that.
265 The majority of those wells are well within the thirty foot thickness and are thicker than that.

Q. But, say within those limits the wells are scattered throughout the field, they were scattered throughout the field, were they not?

A. On a line north to south right down the center of the field, and varying two or three thousand feet in each direction, that is correct.

Q. How far is it from this well over here, this key well, to this well over here, do you know?

A. Approximately ten miles.

Q. Ten miles?

A. Yes, sir.

Q. That is directly across the field, isn't it, east and west?

A. Yes, sir.

Q. Well, they went a little farther than about a thousand feet on each side of the center, didn't they?

A. It is ten miles between wells across the center of the field, counsel. I was speaking from the well to the outside limits of the field.

Q. Oh, from the well to the outside?

A. No, wait a minute. I understand your point. My answer, I believe, to your question was that it was

within the thirty feet sand thickness or closer to the center of the field and you pointed out one instance where the wells are around ten miles apart.

266 Q. Mr. Buck, I am trying to get out of you, if I can, whether or not the Commission selected throughout the field wells in various sections of it in order to make a fair test of the potentials of the wells throughout the field. Now, did the Commission scatter the wells throughout the field or not?

A. They are scattered along a strike line of the field, but not throughout the field, at all.

Q. Do you know whether those wells that were tested, whether the Commission required uniform equipment on those wells, those key wells that were tested at the time this map was made, or before this map was made and on which this map was based?

A. It is my understanding that they did.

Q. Well, then, you can disregard then, can you not, the mechanical equipment of the wells for the reason that the test wells were wells that were all equipped the same way.

A. So far as casing and flow lines is concerned, that is correct.

Q. Well, then, assuming that that is true that the wells were scattered over the field here, and that they were equipped in the same way as far as mechanical equipment was concerned, you get by these tests and by running contours between these key wells contours which reflect roughly the sand thickness in the field, do you not?

A. Oh, yes, very rough.

Q. Well, it is pretty close, isn't it?

A. I think not. I can show you areas in there where it conforms almost exactly and then other areas where it doesn't conform at all.

Q. That is true, but you get the general picture of the higher potentials down the middle where the rate of sand thickness is, don't you?

A. Yes, sir, you certainly do.

Q. And you get the picture also of the lower potentials on each side away from the center in the same way you get the smaller sand thicknesses as you go away from the center?

A. That is correct.

Q. Well, to that extent, you would admit, would you not, Mr. Buck, that the potential test indicates or reflects to some extent the sand thickness?

A. In the way that you have stated it, and the way that you have explained the completion of those wells, I would say yes.

Q. Well, now, does the potential test or the potential contour line reflect to some extent the factor of permeability which you take into consideration, which should be taken into consideration in calculating the recoverable reserves?

A. I had no permeability factor in that and I think your potentials, Mr. Hart, are more of a reflection of permeability than porosity or sand thickness.

Q. The answer, then, is yes, is that correct that the potential tests do reflect permeability?

A. No, I say that in the way you have stated the question it is possible to reflect permeability.

Q. Well, if you have two wells with the same equipment and all of the factors were the same except the permeability and one had a higher permeability than the other, would the one that had the higher permeability show up better on the potential test than would the one that had the lower permeability?

A. Yes, sir.

Q. So the potential test does reflect to some extent the permeability of the sand?

A. All other factors being the same, yes.

Q. All other factors being the same?

A. Yes, sir.

Q. Now, does the potential test reflect to any extent the porosity of the sand?

A. Only in so far as it reflects the permeability.

Q. Well, now, assuming that you have—in other words you say that you first determined the porosity and then you—although you might have the same porosity, you might have more or less permeable sand?

A. That is correct.

Q. And would it or not be possible for the porosity—for the permeability to be the same and the porosity to vary?

A. That is correct.

Q. All right, then, suppose you have two wells where one had a higher porosity than another and all other factors were the same, would the potential tests reflect the difference in porosity between the wells?

A. No, sir.

Q. Would the well that had the higher porosity have a higher potential than the well that had a lower porosity?

A. Permeability being the same the potential test would be the same.

Q. Regardless of the porosity?

A. Yes, sir.

269 Q. Well, now, what other factors then besides acreage would you take into consideration in determining the recoverable reserves that would not be shown in any way by the potential test?

A. Besides acreage you say?

Q. Yes, not reflected in any manner by the potential test.

A. Mr. Hart, I don't know just how to answer a question like that.

Q. Well, aside from the acreage, let me put it this way: Aside from the acreage of a tract, doesn't the po-

tential of a well on a tract, assuming uniform equipment according to the test that was made here, reflect the combination of all the factors that enter into the amount of recoverable oil as they actually work out on that tract?

A. The amount of recoverable oil?

Q. Yes, sir.

A. The potential and the amount of recoverable oil have no connection or bearing at all, sir.

Q. Although potential does reflect permeability?

A. Very decidedly so if taken under the conditions you have given me.

Q. And sand thickness?

A. Sand thickness in some measure.

Q. It reflects pressure, doesn't it?

A. Yes, sir.

Q. Although it reflects those factors you say it has no indication whatever of the recoverable oil?

A. Absolutely none.

Q. I believe you say, Mr. Buck, that you were out there in the field appraising some wells. Did you make tests on the potentials on the amount they would flow in trying to determine whether or not or what the recoverable reserves were under the tract?

A. No, sir, I gave them a pumping test to
270 see what they would produce.

Q. Wasn't the reason of giving them a pumping test to find out how much oil would come up to the surface? That is, what you were trying to find out, wasn't it?

A. Yes, sir.

Q. And by that method of testing what could be produced on a tract you would arrive at a whole lot more accurate estimate of what the factors would be than by sitting down and figuring it out mathematically, wouldn't it?

A. The two statements again don't follow.

Q. You say that is not right?

A. That is not right.

Q. You don't think that by testing the amount of oil that would flow to the top you get a more accurate estimate of the recoverable reserves on a tract than by sitting down and trying to figure out by some mathematical formula what it would be?

A. I didn't testify to that.

Q. Isn't a potential test a method of figuring out how much is going to come to the top?

A. That is nothing more than a mechanical flowing of a well to determine how much will come out at a time. I went over to pump these wells to see whether or not they would produce or not and what it was going to cost me to produce the wells. I had a definite problem, what it would cost me to get the oil out of the ground and how much it would cost to produce.

271 Q. It was an economic problem, nothing to do with the potential of the well.

Q. If you found out those wells wouldn't produce more than ten barrels per day you wouldn't keep on producing them, would you?

A. They are still producing. I didn't purchase the property or recommend its purchase.

Q. Couldn't you just figure out mathematically what those wells would produce?

A. No, sir, because in there, that was a part of the field I didn't know what they would produce.

Q. Is that the only part of the field where you don't know that?

A. No, sir, there are other parts of the field where you don't know that.

Q. So the best way to find out what they will produce is by taking some test to see how much oil is brought to the surface, is that right?

A. In the same type of problem of any well in the Fairway or in the center of the East Texas field which is still flowing I would be more concerned with what

the pressure on that lease was than the cubical content of the—and the aerial extent of the property than I would of taking a potential test out there, whether I flow the well for half an hour or fifty days.

Q. I just want to ask you one more question, Mr. Buck.

A. Yes, sir.

Q. Looking at this diagram here, if you took one of these tracts on the west edge of the field, figuring out the recoverable reserves in place, would you take into consideration the oil that was there in place, or would you take that into consideration only, or would
272 you also take into consideration the fact that part of that oil as the well was produced would be driven towards the east?

A. You would necessarily have to consider, counsel, what oil is migrating up east by the withdrawal of it.

Q. Then, all of these fellows between the western side of the field and Rowan & Nichols are going to be losing oil toward the men to the east of them, aren't they?

A. Yes, sir.

Q. Rowan & Nichols may be hurt some, but not anywhere near as much as these parties here?

A. No, not near as much as the ones west of Rowan & Nichols.

Q. Some are hurt and some are benefited?

A. That is correct.

Q. Rowan & Nichols are just about in the center of the lot, just a little bit over on one side?

A. Yes, sir.

Q. And under any theory of ratable production, the same thing would be true, would it not, more or less that the wells on the west would lose oil to wells on the east?

A. But not nearly in the same proportion.

Q. But not nearly in the same proportion?

A. No, sir.

Q. But the same thing would take place to some extent?

A. To some extent, yes, sir.

Q. Mr. Buck, at one time didn't the Railroad Commission have in effect, I believe you have already testified they had in effect, a plan of proration which allocated a certain amount of oil per well and the rest on a basis of pressure and sand thickness.

A. Pressure and sand thickness or acre feet
273 of sand, I disremember now. It may have been sand thickness, but I think it was acre feet of sand.

Q. I think it is on the basis of sand thickness. Were you working with the Commission at that time?

A. Yes, sir, I wrote the order, whatever it was.

Q. You wrote the order?

A. Yes, sir.

Q. Now, when that system was in effect there was a variation between the marginal, the lowest wells and highest wells, of only seven barrels, wasn't there?

A. I believe that is correct.

Q. And where the lowest got about thirty and eight-tenths and the highest got about thirty-seven and eight-tenths?

A. Something like that.

Q. In other words there wasn't a greater percentage of variation between nearly all of the wells and the highest wells as there is in the present order?

A. No, the spread between the wells was just about the same.

Q. You admit, don't you, that there would have to be some minimum allowable for the field?

A. A minimum?

Q. In order to prevent waste.

A. Yes, sir.

Q. Then, there would only be a certain amount above that that you could prorate among the other wells on any basis?

A. Yes, sir.

274 The Court:

I don't understand that.

Mr. Hart:

I didn't make that clear.

Q. Under any system, then, if you allow a minimum allowable, if you fixed a minimum allowable that you would give to all wells that could produce that much then there—

The Court:

You are talking about the individual wells, not the entire field?

Mr. Hart:

Yes, sir.

The Court:

Go ahead.

Q. A minimum allowable per well?

A. Yes, sir.

Q. And you had a fixed top?

A. Yes, sir.

Q. Then there would be only the difference between that minimum times the number of wells that would produce that and the top to be prorated to do that with?

A. The way you have stated that, that is correct.

Q. And when you take into consideration the order you wrote up of sand thickness and acreage I believe, or sand thickness and pressure,—

A. Sand thickness and pressure.

Q. Sand thickness and pressure, why, there was only a variation between the minimum, which was fixed at thirty barrels and the top of 37.8 barrels, about seven barrels, is that right?

A. That is the way that order was, yes, sir.

Q. That order that you wrote was in effect only about eleven days, wasn't it?

A. Ten or eleven, something like that.

Q. Now, the Railroad Commission has tried
275 a number of different ways in order to try to make a fair allocation of this oil in the East Texas field?

A. Allocation between leases?

Q. What?

A. You mean allocation between leases?

Q. Allocation between wells?

A. Allocation between wells, it has been practically a per well basis of allocation since the beginning of that field.

Q. Well, it was actually on a per well basis up until 1932, wasn't it?

A. Yes, sir.

Q. Then for a while, for about two weeks there, possibly less than that, there was a two-thirds allowable on the basis of per well and one-third on pressure and acreage?

A. Yes, but in effect that was still better than ninety per cent per well.

Q. And then they tried this sand thickness and pressure order that you drew, I believe?

A. Yes, sir, that was still per well.

Q. In 1933 and since that time—they have since about April, of 1933, the Commission has been prorating the allowable in the East Texas field on a basis of the percentage of the hourly potentials, is that correct?

A. A very small per cent of that. It is still virtually per well.

Q. You haven't answered my question.

Mr. Moody:

Read the question.

(Last above question read.)

276 Q. The Commission started out in 1933 allowing fifteen per cent of the hourly potential and it has gotten down to about 2.32 of the hourly potential, is that correct?

A. Yes, sir.

Q. During that time about fifteen or sixteen thousand wells have been drilled in the East Texas field, have they not?

A. Yes, sir.

Mr. Hart:

Pass the witness.

Re-Direct Examination.

Questions by Mr. Moody:

Q. This order here of March 9, 1933, following the hearing on February 23 and 24, 1933—March, 1933, is the date of the order that takes into account pressure and sand thickness. You say you wrote this order?

A. Yes, sir.

Q. Was that your formula or were you told to prepare the order on that formula?

A. No, I was given the figures to prepare that on.

Q. Well was this practically a per well basis?

A. Yes, sir.

Q. A variation of some 7 or 8 or 9 barrels between the wells with high pressure—low pressure and thin sand and the wells with high pressure and thick sand?

A. Yes, sir. The spread there, Mr. Moody, after what they call the marginal oil, the marginal well oil, was deducted from it—that was better than 90 per cent per well.

Q. They had 40 barrels per well first allocated to the so-called marginal wells?

A. Yes, sir.

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Mr. Moody:

May we offer this in evidence?

Mr. Hart:

I have no objection.

(The above referred to document was thereupon received, in evidence and marked Exhibit 13.)

Q. Now Mr. Hart in his questioning asked you about the potential and its reflecting the capacity of the well to produce. Would the potential of any one of the Wood wells—I mean the potential of any one of the wells on the Rowan & Nichols tract being taken and then the potential on the Wood one acre tract or one-tenth of an acre, whichever it may be, being taken, would those potentials reflect the recoverable oil underneath either tract or the acre feet of sand underneath either tract?

A. No, sir, in no way.

Q. All right. Now, then, with the Wood well, whether it be a tenth of an acre or an acre, producing on this schedule or formula or order that is now in force by the Railroad Commission, one well on either one acre or a tenth of an acre, it doesn't make any difference, and the

adjoining Rowan & Nichols tract drilled to a density of one well to five acres—they are in the same contour up there on the potential map, aren't they?

A. Yes, sir.

Q. The two tracts?

A. Yes, sir.

Q. Does the proration order make allowance for the fact that the Wood well is producing from one well on a lease of one acre and the Rowan & Nichols
278 lease—each well on that tract is producing in fact from five acres of sand?

A. No, sir, it does not.

Q. Now is there any way they can take their potential map with all of its lines and all of its key wells and under the orders that are now being enforced there give Rowan & Nichols an equal opportunity to get their oil from under their lease—the equivalent of their oil under their lease along with the opportunity they are now giving this man Wood to get his oil or the equivalent of his oil under his lease?

A. Not within the potential they could not.

Q. Now Mr. Hart asked you if the effect of this order wasn't to let some of the people over to the east get more than their part while some of those over to the west didn't get their part?

A. Yes, sir.

Q. And your red line run through there shows that?

A. That is correct.

Q. Now all of the wells to the west of this red dashed line are getting less than the recoverable oil under their leases?

A. Yes, sir.

Q. Rowan & Nichols is in that crowd?

A. Yes, sir.

Q. Have you figured out—what is the scale on this map?

A. There is 2,000 feet to that.

Q. Come over here and figure about how far they are over amongst the crowd that is getting less than they are entitled to.

A. It is 3,000 feet west of the red line to the center of the Rowan & Nichols lease.

Q. All right, everybody to the east of that line is getting more than the recoverable oil under their lease?

A. Yes, sir.

Q. All right, is there any way to correct that or reduce the inequalities of it under the present order that the Railroad Commission is enforcing in that field?

A. No, sir.

Q. All right. Now if I understand your testimony then Rowan & Nichols suffer by reason of the general application of the order to the entire field which results in giving the fellow over on the west more than his part of the oil and also Rowan & Nichols suffer by reason of the fact that under the order a man that is producing from an acre or a tenth of an acre is allowed to produce per acre per day many, many times—some four or five times—as much per acre per day as Rowan & Nichols on their larger lease drilled to a less density?

A. Yes, sir, that is the two things he suffers from.

Q. Suffers from both of those.

A. Yes, sir.

Q. In other fields in this State has the Railroad Commission in fixing and allocating the field allowable amongst wells, have they taken into account acre feet of sand underneath the leases?

A. I don't know of any that have taken into account acre feet of sand.

Q. Sand thickness, then?

A. They have taken in acreage as a factor.

Q. All right, some have taken into account acreage. Is that many or few other fields?

A. Quite a few of the fields have taken in acreage in their allocation formula. I mean quite a number of them have.

Q. Now in those fields is the spacing more uniform than in this field?

Mr. Hart:

We wish to object to any testimony about the method of allocation of any fields.

The Court:

I think you are going a good way afield.

(At this time a short recess was taken, at the conclusion of which the following proceedings were had:)

Q. Mr. Buck, if the wells in the East Texas field were allowed five barrels a day or some such figure, those that were allowed to produce at such a figure, and which if produced daily that amount might cause dead oil to accumulate in the column and produce producing difficulties, if they were allowed to produce that rate, but would produce four or five days in one day, would that eliminate those difficulties of producing dead oil that you testified about in your testimony?

A. Yes, sir.

Q. Now Mr. Buck do you know of any other methods of proration or allocating the field allowable among the wells in the field that could be adopted and which would not create waste and would give an owner the benefit of his advantage in structural position and the benefit of the acre feet of sand or sand thickness or oil reserved underneath his lease?

A. Yes, sir.

Q. Name some of them.

281 A. The acre feet of sand section times the bottom hole pressure or acre feet of sand section plus potential or acre feet of sand section times

potential or a straight acreage plan of proration plus bottom hole pressure corrections, and many others, Mr. Moody, that you could put into an order that would more nearly approach the point that you are speaking of than the present order.

Q. Would any plan of proration that disregards acre feet of sand underneath the lease or sand thickness or oil reserves underneath the lease, disregards those things, will any plan of proration such as that give a man the advantage of his recoverable oil and his position on structure?

A. No, sir, if it disregards those factors it will not.

Q. What will the result be?

A. It will be the taking of oil from one lease or one tract and giving it to another.

Q. Mr. Hart asked you some questions from this sheet here where you calculated the oil reserves underneath this Rowan & Nichols tract of land?

A. Yes, sir.

Q. This is Plaintiff's Exhibit 2. Was that figuring based on the present plan of proration?

A. Yes, sir.

Q. Now, Mr. Buck, have you prepared a device, constructed a device by which you can demonstrate that the present plan of proration will deprive Rowan & Nichols of their proportionate part of the oil or that proportionate part which they bear to the whole, whereas it will give to the folks to the east of their lease many times their proportionate part of the oil?

A. Yes, sir.

Q. Do you have that device in the Court Room?

A. Yes, sir.

Q. How long would it take you to conduct the demonstration?

A. Possibly five minutes.

Mr. Moody:

I know Your Honor doesn't like demonstrative evidence, but if the Court will permit it we would like to make that demonstration.

The Court:

Why didn't you make it on direct evidence?

Mr. Moody:

The device was not ready at that time.

Mr. Tilley:

It broke and we had to fix it.

The Court:

All right.

Q. Mr. Buck, what are you running into the device now?

A. Kerosene. The device is a replica of the cubical cross section of the East Texas oil field and it has been graduated and calibrated for its cubical content and is being charged with kerosene and water.

Q. The kerosene represents the oil, does it?

A. Yes, sir. I remove the test tubes from the side of the exhibit and then it is quite apparent that the top part of the reservoir is filled with the oil and the lower part is filled with water and it is quite easy to see the oil-water contact in the reservoir. I have a water head. Now when the water reaches the wells the production ceases. That approximately floods the East Texas oil field, as shown in this exhibit.

Q. I don't think it would be necessary, Mr. Buck, to measure it, but when the water strikes this tube does it cease to produce?

A. Yes, sir.

— Q. And so on down the line?

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A. Yes, sir.

Q. Now did you have some difficulty in getting the tubes in the center opened up?

A: That is right. Capillary contraction. Bubbles get in there and it doesn't work.

Q. But did your tubes over to the right fill up with kerosene, more of them than to the left and center?

A. Yes. You will recall we had two full tubes and this much out of the last well. A full tube out of the next to the last and then it comes down in steps.

Q. Which does the right represent, the place where you got the most oil or kerosene out of your device?

A. The eastern side of the East Texas field.

Q. Have you at other times attempted that demonstration and had your tubes open and have it demonstrated that these tubes that are in the part of the device that represents the east part of the East Texas oil field will flow more than the tubes to the center or other end?

A. Yes, I have calculated that error and have run numerous tests on it and figured out the percentage of gain and loss.

Q. Will you state those figures into the record, please?

A. I will give you that, first in cubical centimeters. The oil in place in each of the 8 zones across the field. Zone No. 1 has 27 cubic centimeters. Zone 2—I beg your pardon, Zone No. 1 has 7.29 cubic centimeters. Zone No. 2, 21.8. Zone 3 has 36.4. Zone 4 has 51.08. Zone 5 has 51.08. No. 6 has 36.48. No. 7 has 21.89 and the last one 1.29. In the last test that I ran the first tube
284 did not produce any oil. The water level rose before there was any production, or any that I could measure. The second tube produced 7 cc of oil. The third 12. The fourth 20. The fifth 30. The sixth 39. The seventh 50, and the eighth 65.

Q. All right. Now those things are equally spaced there and of equal size?

A. Yes, sir.

Q. What is intended to be demonstrated by this device?

A. The model tends to demonstrate the movement of the water from the west and from underneath and displacing the oil from the field and showing the structural advantage and production advantage that properties on the east side have over those to the west.

Q. Does it tend to demonstrate the accuracy of the red line you have drawn as your zero line on this plaintiff's exhibit?

A. Yes, sir.

Q. And your proposition that east of the line they produce more oil than they had in place?

A. Yes, sir.

Q. And those west of the line wouldn't get what they have in place now?

A. Yes, sir.

Mr. Moody:

We would like to have permission, Your Honor, to file a photograph and description of this later on.

The Court:

Yes.

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Re-Cross Examination.

Questions by Mr. Hart:

Q. Mr. Buck, that experiment you have there illustrates the way the field would act if there was no sand in it, nothing to impede the flow of the oil and water and if the wells were equally spaced and operated on open flow, is that correct?

A. No, I don't believe that that is what the model represents, Mr. Hart.

Q. Well there is nothing in that model to impede the flow of the kerosene and water, is there?

A. No, sir, there is nothing in there to impede it. Of course they are choked with a one-eighth inch copper tubing there.

Q. All of those tubes there they were the same width, inside width, were they not?

A. That is correct, all the same. Each well produced at the same rate.

Q. At the same rate?

A. Yes, sir.

Q. The same rate per well, wasn't it?

A. While it was producing, yes.

Q. While it was producing?

A. Yes.

Q. Well under that method then the man that was here on the west side of the field—say that corresponds to the west side of the field—although he originally had some oil in place, he wouldn't get any out?

A. No, sir, he didn't under that test.

Q. Didn't get any out?

A. Yes, he didn't.

286 Q. As you progressed to the east you got a higher percentage or even more than you had in place?

A. Yes, sir.

Q. That goes to show the structural advantage the leases to the east have by reason of their position on the structure, doesn't it?

A. And by reason of the constant rate of flow from these wells.

Q. And the constant rate of flow from these wells?

A. Yes, sir.

Q. Would that be true under any rate of flow which you adopted, which was constant?

A. Per well?

Q. As between the wells.

A. Yes, sir, it would be true under any rate of flow that was constant between wells.

Q. And those wells were all opened up as much as they would flow, weren't they?

A. Yes, under the hydrostatic head I placed under them.

Q. Not any of them were restricted more than any other?

A. No.

Q. Now in taking into consideration the reserves under the method that you have outlined do you take into consideration the fact of the position on the structure or do you consider just the amount of oil in place under the particular tract?

A. The amount of oil in place under the particular tract has no bearing or very little bearing on the amount of recoverable reserve under a different set of conditions, Mr. Hart.

Q. All right, sir. Now let's take your exhibit there.

A. Yes, sir.

Q. Under the first tract there was 7.29 cubic
287 centimeters, but no actual recoverable oil?

A. That is correct.

Q. All right, sir, under the second tract there was 21.8 cubic centimeters, but only 7 cubic centimeters of recoverable oil?

A. That is correct.

Q. Well you go on down and get on the last where there was only 7.29 cubic centimeters of oil, but there was 65 cubic centimeters of recoverable oil?

A. Yes, sir.

Q. Is that correct?

A. Yes, sir.

Q. That is the way you would figure recoverable oil?

A. No.

Q. Under the system of withdrawal you mentioned there?

A. Under the system of withdrawal this demonstrates, yes, that is the way; you would have to estimate it.

Q. The amount of recoverable oil?

A. Yes, sir.

Q. In other words you would give to some tracts many times the amount of recoverable oil, many times as much as the oil in place?

A. I wouldn't give it to them, they would produce it.

Q. Then if you are calculating the recoverable oil you would have to calculate that into it, wouldn't you?

A. Yes.

Q. And that structural advantage existed as between tracts before the Railroad Commission took any hand in it, didn't it?

A. The structural advantage of the properties
288 was there a long time before the Railroad Commission, yes, sir.

Q. Now the density of the drilling as between the Wood tract and the Rowan & Nichols tract in his question assumed that there was a disparity of the density and drilling there. If the Rowan & Nichols tract is drilled to a greater density than the average surrounding areas either if you take a small distance or a large distance or if you take the whole field, then on a density basis Rowan & Nichols isn't at any disadvantage under the present system, is it?

A. Yes, sir.

Q. On a density basis?

A. On a density basis they would have to be way above the average density of the field to take advantage of the movement as I have demonstrated here of that water pushing the oil westward.

Mr. Moody:

Eastward you mean?

A. Yes.

Q. Disregarding that for the time being, we talked about the position on the structure which you said was naturally there. As far as the density is concerned they are not at any disadvantage with the surrounding area?

A. No, I believe the immediate area around the Rowan & Nichols area is approximately the same.

Q. And they have been drilled to approximately the same density as the field as a whole?

A. Close to the same average of the field, that is true.

Q. Won't Rowan & Nichols by reason of their
289 advantage recover more oil per acre than the surrounding tracts which are not so densely drilled?

A. They will recover more oil per acre than the area that lies to the west of them on the same density or greater density, and they will recover less oil per acre on an even wider—greater density than the properties to the east. That zero line of maximum recovery has to stay on that lease under your present method of allocation.

Q. Is there any method of allocation which would entirely eliminate the advantage of the structure?

A. Not entirely eliminate it, no, sir.

Q. Now if you took—if you wanted to give this first man on the west the amount of oil which was in place under his tract before you started letting the wells flow, about the only way you could do that would be to shut off the wells to the east until he had driven an equivalent amount of oil from under his tract?

A. Yes. We had an oil field in this demonstration. It was completely developed. We started developing at the same time, and so naturally this man from the east took it before the man from the west had an opportunity to get it.

Q. In order to give it to him you would have to shut off the wells to the east?

A. Or choke them down or reduce their rate of flow.

Q. You would have to make an entirely different calculation for each of those wells to the east?

A. Each of them would be in proportion to its reserves.

Q. Well, now as applied to the field which is
290 now drilled up all over the field from the west to the east, if you are going to allow the man on the west the oil that is in place under his tract you will have to greatly restrict the wells to the east, will you not?

A. If you give him that oil that is under his tract unquestionably you will have to restrict the production of the wells to the east.

Q. That will have to be taken into consideration in restricting the production of Rowan & Nichols and other tracts in the center, would it not?

A. Yes, sir.

Q. To what extent would Rowan & Nichols have to be restricted in order to allow that recovery to be made by the wells to the west of them?

A. That I couldn't tell you.

Q. You couldn't tell us that?

A. No, sir.

Q. Could you give us any estimate on that?

A. I can give you an estimate on it in the amount of reserves under each tract and on a per cent of recovery, but to get all of that oil out of there, instead of restriction I believe we would have to go to shutting the field in there to give it to them or the rate of extraction to the east would have to be necessarily so small I don't believe I could calculate it for you, Mr. Hart.

Q. Let me ask you this one more question.

A. Yes, sir.

Q. The recoverable reserves of a tract are
291 calculated differently, would be calculated differently by you, depending upon the method of production in the field?

A. Yes, sir, your method of allocation is a function of your recovery.

Q. It would be one thing under open flow, another thing under the present system and it would be still another thing if you restricted the wells on the east in order to allow the wells to the west to get all of the oil under their tracts?

A. Yes, sir, that is true.

Q. Now, Mr. Buck, have you made any calculation of the recoverable oil in place under the Rowan & Nichols tract, if you assumed that you are going to adopt a method of allocation by which you are going to allow to each well substantially the oil belonging to it in place?

A. No, sir, I have not.

Q. You haven't made any calculation of reserves on that basis?

A. Under the Rowan & Nichols tract, yes.

Q. Under the present system of proration?

A. I made a calculation of the recoverable oil. That is two different things, counsel.

Q. The original reserve was the total amount of oil originally in place?

A. That is correct.

Q. Now could you tell us of that oil originally in place what per cent of it was recoverable oil, oil that could be recovered through oil on the Rowan & Nichols tract without migration?

A. My calculation you say?

Q. If you had a method of allocation to restrict the wells on the east so the wells on the west would
292 get oil in place under their tract or a certain percentage of the recoverable oil in place under their tract? What would you say was the amount of recoverable oil in place under the Rowan & Nichols tract?

A. I gave you a figure of 1,500,000. Now what per cent are we going to be permitted to save? Whatever per cent you say of that 1,500,000.

Q. The only way you could give them 100 per cent of the oil under their tract, assuming it could be brought to the surface, would be to close a section to the east and let the other section produce until it got all it could and then open up another section?

A. To give 100 per cent, yes, sir.

Q. And gradually carry that on east?

A. Yes, sir.

Q. And in order to carry that into effect you would have to restrict those on the east until those on the west had produced their oil?

A. You said you were going to shut them in.

Q. In order to accomplish the result of letting the men on the west get their oil you would have to do that?

A. 100 per cent, you are right.

Re-Direct Examination.

Questions by Mr. Moody:

Q. Mr. Buck, I started to ask you if this device didn't demonstrate the advantage of structural position, and you said yes. I will ask you if it doesn't also demonstrate how the natural advantage of structural position
293 where the wells are allowed to take equally from the common reservoir?

A. Yes, it shows the exaggeration of that natural position.

Q. Now another question with reference to this last series of questions as to how you get the oil exactly under each man's place. You are not advocating the closing in of wells in one part of the field until a fellow in another part of the field gets his oil?

A. No, sir, not at all.

Q. Is it your position that orders can be written that will take into account one man's advantage over the other in the acre feet of sand he has and his structural position, that will give him a more equal opportunity to produce oil

along with other lease owners than the order now in force in the field?

A. Yes, sir, that is my contention all along.

Q. And it is your contention that the present order operates to deprive Rowan & Nichols of their property?

A. Yes, sir.

Re-Cross Examination.

Questions by Mr. Hart:

Q. Do you have any specific plan, Mr. Buck?

A. I have no specific plan worked out to mathematical accuracy, but I can suggest several.

Re-Direct Examination.

Questions by Mr. Moody:

Q. That loss that Rowan & Nichols are suffering is a material disadvantage, isn't it? It is greater than ten per cent of their property, isn't it?

A. Yes, sir, I believe it is.

(Witness excused.)

294 Mr. Tilley:

If the Court please, we would like to offer at this time the order of the railroad commission in Case No. 25,545, which is a denial of the application for adjustment of the allowable of Rowan & Nichols; and the order of April 8, 1938, granting a motion for rehearing on that same order I just introduced.

Mr. Hart:

This is an order granting Well No. 6.

Mr. Tilley:

It is also denying the application.

Mr. Hart:

I see.

(The above referred to document was thereupon received in evidence and marked Exhibit 14.)

Mr. Tilley:

I want to offer in evidence at this time also—although I think under the new rules it is already admitted—the motion for rehearing which is attached to the plaintiff's petition. I now offer the order of April 8th, granting the motion for rehearing, and although I think it is in evidence, I want to be sure.

(The above referred to document was thereupon received in evidence and marked Exhibit 15.)

I think you will stipulate that after the motion for rehearing was granted, and the rehearing was had, that the railroad commission still has the matter under consideration and has not entered any order of any kind?

Mr. Hart:

I think that is correct, Mr. Tilley. If it is not correct I want to be free to offer the true facts.

Mr. Tilley:

All right. We now offer the order of August 29, 1938, Docket Nos. 108 et seq., which is the proration order which we complain of, and the stipulation shows that it is agreed that we made the same complaint to and our petition is so considered as the same complaint to the subsequent orders which are the same as that one. We also offer in evidence Rule 37, which is a spacing rule, as amended, as applied to the East Texas field, which is dated May 29, 1934. We would also like to offer at this time and have it given an exhibit number,

although we do not have a copy here, the order which fixed the first potential for the East Texas field. That is the allowable on an hourly potential basis of the present series, which has been supplemented from time to time.

(The above referred to documents were thereupon received in evidence and marked Exhibits 16 and 17; and the order last above referred to was designated Exhibit 18.)

Now, your Honor, we would like to offer—if I understand the Federal Court procedure properly—the proration schedule of January 1, 1939, if it is agreeable to the parties that in the event either party appeals we will not have to have the reporter copy this schedule, because it is printed, and if it should go to the Appellate Court they might want to have access to it since it refers to almost every well in the field.

The Court:

You can offer it and if there is an appeal taken the Court can direct it to go up as an original document.

Mr. Tilley:

That is fine. We offer that. With the exception of that, subject to my asking permission that my announcement may be withdrawn after I talk to Mr. Moody, the complainant rests.

296 (The above referred to document was thereupon received in evidence and marked Exhibit 19.)

Mr. Tilley:

Complainant rests.

Mr. Hart:

If the Court please, we wish to file a motion at this time for judgment.

The Court:

I will carry it along with the case. I want to hear the evidence.

(At this time a recess was taken in this case until 9:30 o'clock a. m. of the next day, February 8, 1939, at which time the following proceedings were had:)

297 V. E. COTTINGHAM, a witness for the Respondent, having been first duly sworn, testified as follows:

Direct Examination.

Questions by Mr. Hart:

Q. State your name, please, sir.

A. V. E. Cottingham.

Q. What is your profession or occupation, Mr. Cottingham?

A. I am a petroleum geologist and engineer.

Q. State to the Court, please, what education you have had for that profession.

A. I am a graduate from the School of Geology from the University of Oklahoma; I have had one and a half years graduate work in that school.

Q. After you graduated from the University of Oklahoma what practical training did you have as a geologist?

A. I taught one year in the University of Oklahoma; I was a field geologist doing detailed mapping in Oklahoma, Arkansas, Louisiana, Texas and New Mexico; I have been employed by different companies. The first year out of school I was employed by an individual. After

that employment I was employed by the Empire Gas & Fuel Company at Bartlesville, Oklahoma, with headquarters at Bartlesville, I worked in the valuation department for a few months and then went to El Dorado, Arkansas, in charge of geological exploration in Arkansas. I came to Texas in 1923 for that company as district geologist and worked out of San Antonio in the Balcones

298 Fault district of Southwest Texas and later established an office for them in San Angelo, Texas.

Then I was employed by the Shell Petroleum Company, that was the old Roxiana Company, with headquarters at San Angelo—no, the first headquarters were at Carlsbad, New Mexico. That district was later consolidated with or at San Angelo, and in the capacity of district geologist I had charge of Texas and New Mexico. Later I went with the Exploration Company of Texas as chief geologist and stayed with them eighteen months, and formed a partnership of Cottingham & Brice Company. We did valuation work, we bought and sold royalties and drilled wells. Then I came with the Commission.

Q. When did you come with the Railroad Commission, Mr. Cottingham?

A. I came with them September 1, 1931, when proration became a function of this state.

Q. Had the East Texas field been opened at that time? Had it been discovered and drilled to any extent?

A. Yes, the field had been discovered approximately a year before. The legislature passed a conservation law, and the duties of prorating oil was placed on the employees of the state rather than the companies. I was in that first group to be employed, and my first assignment was in the East Texas field.

Q. Had you become familiar with the East Texas Field before you went with the Railroad Commission?

A. No, I had not.

299 Q. Since you have been with the Railroad Commission of Texas have you made a study of the conditions in the East Texas field?

A. The first nine months with the Commission I was in the East Texas field. Then the next nine months I had charge of the San Angelo district for the Commission. Then the following ten months I was in the East Texas field, making a total of nineteen months in the field.

Q. What generally were your duties when you were stationed in the East Texas field?

A. More particularly along conservation lines, making water surveys, trying to detect leaky casing, and special conservation problems.

Q. Since that time, since the last period that you spoke of, when you were stationed in the East Texas field, what connection have you had with the Railroad Commission and what generally have been your duties?

A. My duties since October, 1935, has been at first I carried the title of chief petroleum engineer for the Commission, and when Mr. Griffin resigned I took his place as what is called as director of production, which position I have held now for approximately three and a half years.

Q. What duties do you have with reference to the East Texas field in your present position, in the position you have held since 1935?

A. I have charge of the engineering as it is carried on in the field.

Q. Have you kept up with the conditions in the East Texas field?

A. Constantly for the last three and a half years.

Q. Have you studied the information which is furnished to the Commission by the operators in the East Texas field, and all other information that is available to the Commission in connection with that field?

A. I have.

Q. Now, Mr. Cottingham, have you here in Court an exhibit showing the general structural condition of the

East Texas field, showing its position with reference to the overlying and underlying strata and so on?

A. I have.

Q. Is that it, this box exhibit here?

A. That is a generalized view of the surface and sub-surface condition obtaining in the Woodbine reservoir, Woodbine Basin.

Q. I don't want to take much time with this, but the top of this box exhibit which you have here in Court shows the surface relation of the East Texas field to the portion of Texas which is around it, is that correct?

A. That is correct.

Q. And this dark green area here indicates the surface position of the East Texas field?

A. Yes.

Q. With reference to the surface?

A. That is correct.

Q. And then the side of this exhibit shows a
301 cross section of the East Texas field, is that correct?

A. That is correct.

Q. This little black triangular part here represents the East Texas field?

A. That shows a cross section of the Woodbine that is productive of oil. That dark part also shows the original estimated water level.

Q. You haven't undertaken, in this small exhibit, to indicate the variations within the Woodbine sand in the East Texas field?

A. No, the purpose of this box diagram, the field is said to be under water drive, and that is a graphical illustration to show the general mechanics of how the water gets into the basin and the magnitude of hydrostatic head giving rise to pressure.

Q. Have you had prepared photographs of each side of this box which can be introduced in evidence?

A. Yes. I would like to introduce maps illustrative of the top and bottom rather than the box diagram.

Mr. Hart:

We wish to offer those in evidence.

Mr. Tilley:

We would like to have this limitation on it, we would like to have the right to examine it.

Mr. Hart:

Yes, sir.

Mr. Pollard:

Here is a copy of that.

(The above referred to exhibit was thereupon received in evidence and marked Exhibit 20.)

302 Q. Now, Mr. Cottingham—

A. I would like to say that this generalized cross section on the box representing a cross section from the outcrop to the East Texas field was taken from Dr. Plumber's report of the Woodbine Basin and the scales and values there were taken from that report, which is a recognized university publication.

Q. I think the Court is familiar with the general situation in the East Texas field, Mr. Cottingham. We will pass on from that. Now, at the time the East Texas field was first drilled what was the approximate bottom hole pressure in that field?

A. Approximately 1,625 pounds per square inch.

Q. Was that pressure uniform throughout the field at the time the field was first opened, first drilled?

A. It was uniform practically.

Q. In other words, was there any pressure gradient in the field at that time?

A. There was practically none.

Q. In other words, the pressure was practically uniform throughout the field?

A. That is correct.

Q. Now, was the East Texas Field produced at first under a system of limited production or not?

A. No, the field at first was produced at rates—high rates. In other words, they produced them practically at the rates that they could dispose of the oil.

Q. Did that cause any pressure gradient in the
303 field, Mr. Cottingham?

A. That is correct, as soon as production started then that established a pressure gradient across the field from west to east.

Q. Where were the higher pressures and where were the lower pressures when that gradient was caused by this production?

A. The higher pressures were on the west side of the field.

Q. The lower pressures were on the east side of the field?

A. Correct.

Q. As the field was produced was there or not a drop in the average bottom hole pressure in the field?

A. That is correct.

Q. Now, what was the drop in the bottom hole pressure during the first period in which the field was produced, do you have information on that?

A. I have information so far as four break-downs are concerned. Here one started from the discovery of the well when the pressure—that was the first production, around October 10, 1930:

Q. All right, sir.

A. And from that date to June, 1933, the Bureau of Mines estimated that the field produced \$319,996,000 barrels of oil as the pressure dropped from 1,625 pounds to 1,240 pounds per square inch. This totaled 385 pounds for 319,996,000 barrels.

Q. What was that average drop, then, per million barrels of oil produced during that period?

304 A. The drop was 1.2 pounds per million barrels produced.

Q. Now, have you also calculated the drop in bottom hole pressure and correlated that with the amount of oil produced during the next period?

A. I have figures before me which shows the drop in pressure from the discovery date to December 8, 1938. I didn't bring it to the present time because I didn't have all the figures.

Q. All right, ~~will~~ you give us that?

A. During that approximate eight year period there was a pressure drop of 515 pounds, during which time 1,277,856,000 barrels of oil was produced. The drop, that is the overall drop, from discovery date down to December 8th, this year, totaled four tenths of one pound per square inch per million barrels produced.

Q. Now, have you broken that down to show the drop in pressure from June 10, 1933, up until December 10, 1938, which is approximately the time the present proration order has been in effect?

A. That is correct.

Q. What is that?

A. The Railroad Commission of Texas, through its engineering department, has monthly made bottom hole pressure surveys in the East Texas field since June 10, 1933, to the present time. The original surveys were based on thirty-four key wells, until September 12, 1937, after

305 which time the average bottom hole pressures were computed from ninety-one wells. From June 10, 1933, or the beginning of the Commission taking bottom hole pressures, and we have the map here, this totals five years and seven months. During this time the production has totaled 906 thousand—906,760,000 barrels. The pressure drop at the beginning of the period—the pressure at the beginning of the period

was 1,240 pounds per square inch, and this last December 8th it was 1,106.78 pounds per square inch.

The Court:

What did you say it was?

The Witness:

It was at the beginning of the period 1,240—

The Court:

I have that.

The Witness:

And at the end of the period it was 1,106.78 pounds per square inch, which gives an overall drop during this five years and seven months of 133.22 pounds per square inch. That would—for this period the pressure drop has averaged 147 thousandths. To read it would be .147 pounds per million barrels allowable.

Mr. Moody:

Mr. Hart, may I ask a question? I don't understand. Is that the maximum pressure in the wells where the bottom hole pressures were taken or the average or what?

Q. Explain that, please, Mr. Cottingham.

A. Each month the Railroad Commission takes the pressures on ninety-one key wells, bottom hole pressures, and this is the average pressure for the field that I am referring to here, determined by those various
306 monthly surveys.

Q. Mr. Cottingham, have you also tabulated the drop in bottom hole pressure during the last fifteen months and compared that with the production of oil during the last fifteen months?

A. The chart should reflect those various periods, these last periods that we have.

Q. Well, go to the chart, then. Do you have that information available there?

A. Yes. During the last fifteen months, from October 12, 1937, to January 8, 1939, the average bottom hole pressure has dropped from 1,118.56 pounds per square inch to 1,106.78 pounds, or the overall drop for those fifteen months totals 11.78 pounds per square inch. During this period the allowable for the total—the allowable for the fifteen month period has totaled 189,747,000 barrels. The pressure drop per million barrels allowable for this period is .062 pounds per square inch.

Q. That is the drop per million barrels of allowable oil?

A. That is correct.

Q. Then comparing these different figures that you have calculated here, Mr. Cottingham, has the rate of drop of the bottom hole pressure in the East Texas field decreased or increased recently?

A. It has decreased.

Q. There is—

A. Per million barrels of production it has decreased.

Q. In other words, there is a very small drop
 307 in the bottom hole pressure per million barrels of oil produced from the East Texas field under the present system of proration?

A. The last fifteen months it is practically negligible.

Q. Do you have a chart showing the comparison of drop in the bottom hole pressure and amount of oil produced from the East Texas field?

A. That is correct, I have.

Q. Would you please step over here and point out to the Court that?

A. This small chart here is the reproduction of the large chart that is being placed on the board.

Mr. Moody:

Which is that, Mr. Cottingham?

The Witness:

This chart here, the one that the Commission wishes—this is so big and bunglesome, and the small chart will serve the same purpose. This is just a photostat reproduction with the exception of one or two months down here.

Mr. Hart:

I would like to mark this exhibit (marked Exhibit 21).

Q. Now, what is this top red line, what does that indicate, Mr. Cottingham?

A. The top red line shows the average bottom hole pressures for every pressure period, of approximately one month, since June 10, 1933, until January 8, 1939.

Q. The black line indicates what?

A. The black line indicates the daily average production for each of the pressure periods, for each of
308 the pressure periods.

Q. Of course the black line does not show the cumulative production, just the production for each period, is that correct?

A. That is correct, the daily production, average daily production, for each pressure period.

Q. Does that chart show graphically the facts which you have already testified to with reference to the periods of production in the East Texas field?

A. No, the first period that I referred to was from the discovery date of the field down to the beginning of this chart.

Q. I see.

A. And this chart reflects the date. And I gave it on the other three break-downs.

Q. That is from—

A. And then for the overall picture from the discovery date to December 8th, this chart was taken into consideration for part of that analysis.

Q. In other words, this shows the condition from June 10, 1933, up to December 10, 1938?

A. December 9th, I believe, 1939.

Q. This is 1939 now.

A. Yes. Well, we have that survey.

Q. Up to what date in 1939?

A. That is January 8, 1939.

Q. All right, generally this shows that where
309 you have the higher production from the field
you got a drop in the bottom hole pressure, is
that correct?

A. The pressure drop is accelerated by the amount of withdrawals.

Q. When you get down here to the most recent period where you had fairly steady production from the East Texas field do you find—on here you find what has been the result on the bottom hole pressure in the field?

A. The drop during this fifteen month period, during which time 189,000,000 barrels of oil was produced, has been slightly more than eleven pounds.

Q. Is this exhibit here, which I will mark Exhibit 22, is that a photograph, a reduced photograph of this larger chart?

A. It is.

Mr. Hart:

We wish to offer in evidence the small chart, Exhibit 22.

(The above referred to exhibit was thereupon received in evidence, the same having been marked Exhibit 22.)

Q. Now, Mr. Cottingham, you spoke earlier in your testimony of a pressure gradient which was set up by reason of the production from the field, which was first unrestricted and afterwards under proration. Do you have charts showing pressure gradients in various periods,

showing the variation in pressure from the east to the west side of the field?

A. Yes, we have some pressure maps, one
310 showing the pressure pattern obtaining in 1935.

Q. Let's mark that Exhibit 23.

A. November 12, 1935.

Q. Now, just explain that please, sir, that Exhibit 23.

A. This map shows the pressure pattern obtaining as of November 12, 1935. The high pressures are on the west and the low pressures are on the east. The isopiestic lines, or lines that connect points of equal pressure are in fifty pound—are fifty pound lines.

Q. All right, sir, the next one was this Exhibit 24.

A. It is a pressure map, bottom hole pressure map, reflecting the pressure pattern as of January 12, 1936. It is almost similar, the pressure pattern is almost similar to the previous one, as will be noted from the colored bands.

Q. Now, what is this relief map you have here. What period does that show the pressure gradient in the East Texas field?

A. That shows the pressure gradient as of September, 1937, and the purpose of showing it in that manner was to give a better idea of what is meant by pressure gradient. The pressure gradient in the south end of the field is very high. The pressure gradient in the north end of the field is very low.

Q. Mr. Cottingham, at this point could you explain to the Court how it is that although the average pressure throughout the field was approximately the same at the
311 time the field was first opened, that the pressure gradient has been so upset that there are portions of the field very much lower in bottom hole pressure than other portions, why that grades off from west to east?

A. In order to have flow it is necessary to have pressure differential. The motivating force that pushes the oil

in the bore of the well in the East Texas field is water-drive, as demonstrated by this exhibit number whatever it is.

Q. The box exhibit?

A. The box cross section of the East Texas field. In other words, the original pressure was derived from hydrostatic water. The water itself under that pressure moves into the reservoir, partly down through the outcrop, but more particularly the immediate effect is the expansion of the water as the oil is withdrawn. As the oil is withdrawn the water encroaches. The oil in the reservoir has a coefficient of expansibility, and when you take oil out of the reservoir this water which was originally under a pressure of 1,625 pounds per square inch started moving in and maintaining that pressure. In order to get flow it is necessary, though, to have differential in pressure, so as the water out in the reservoir, having more pressure, as the oil was withdrawn, than the oil in the oil reservoir itself, that set up pressure gradients from the direction of the source of the pressure to the east side of the field.

Q. Mr. Cottingham, is the East Texas field a
312 homogeneous sand? That is, is it all the same character (are there variations in the sand, in porosity and permeability, and also do you find lenses of shale and things of that kind which would cause a— cause pressure gradients to be set up?

A. The East Texas field extends over an area of forty miles from north to south. We find variable conditions with reference to the character of the formation which is productive of oil.

Q. Explain how that would cause this pressure gradient to occur. In other words, is the East Texas field a reservoir like the exhibit introduced yesterday where the oil and the water flows freely?

A. No. 7

Q. Or where the oil flows more rapidly in some portions of the field than others?

A. In the north portion of the field the sand conditions are more uniform. They have a high order of permeability and the pressures from the west to the east can be transmitted through the oil body much more rapidly than it can in the south because of that condition. In the south part where you have a great deal of shale intermixed with the reservoir rock shale and impermeable volcanic ash the pressure can't be transmitted through that entire body with the ease that it can up in the north end. Therefore, on the south—on the extreme east portion of the south end of the field the pressures become much lower
 313 than they do on the west side in that area. The rates of withdrawal are such that the pressures on the east side can't be maintained. In other words, the pressure can't be transmitted throughout the oil body.

Q. Do those same variations exist to a less degree in the north as they do in the south?

A. The north end of the field is much more uniform in the general permeable condition of the field.

Q. I will mark this Exhibit 25. Do you have another chart?

The Witness:

Mr. Hart, if the Court will permit me?

The Court:

Yes.

The Witness:

I didn't mean to present that as an exhibit.

Q. Can you reproduce it on a chart?

A. We have one here which reflects practically the same thing.

The Court:

The only use you would have for it would be to transmit it to the Circuit Court, and I am sure they would let you bring it back right away. They don't want it around and I don't want it here, so it is just a matter of a few days, unless you have some constant use for it.

The Witness:

We have no constant use for it.

The Court:

Let it go in, then.

Q. I will ask you to look at Exhibit No. 26 and state to the Court what that shows, Mr. Cottingham.

A. Exhibit 26 is a bottom hole pressure map of the East Texas field, reflecting the pressure pattern as of January 8, 1939.

Q. It shows the same gradients from west to east as the other charts, is that true?

A. No, there is a difference. If you will note here you have four bands. The map of 1935 has four bands. The chart of 1936 has four bands across the middle part of what is commonly known as the Gladewater Nose. Over here the pressure pattern has become more—the gradient is less from west to east. In other words, the gradient here has decreased during the last few months.

Q. What is the difference in pressure between the first section that you have on the west and the last section on the east, in that portion of the field?

A. The blue shows from 1,150 to 1,200, and the red in each case of these 1935, 1936 and 1939 charts, the red dash red is between twelve and twelve hundred fifty pounds per square inch. It shows the travel of the 1,200 to 1,250 pressure from east to west. In other words, this 1,200 to 1,250 is over here. Now it is a little closer here in 1939 to the west side, and here it is almost off the map,

showing the travel of that particular pressure band, that it has moved from east to west.

Q. Are you familiar with the location of the Rowan & Nichols B Todd lease which is involved in this case?

A. I am.

Q. Do you know in which pressure contour that lease falls in the most recent map, that is, Exhibit 26?

A. It falls between the 1,100 and 1,150 pound pressure band or zone.

315 Q. Now, Mr. Cottingham, is the sand, is the Woodbine sand in the East Texas field of uniform character or not?

A. It is not.

Q. Would you explain—

A. If you take the field as a whole, and that is necessary when you apply a common yardstick across it in proration.

Q. Would you explain the different characteristics that you find in the Woodbine sand throughout the different sections of the East Texas field?

A. As previously pointed out, the north end of the field, more uniform conditions obtain than in the south end. You take the pressure patterns of those various maps reflect the very permeable condition in the north end of the field, and in the south end a very tight, impermeable condition, either occasioned by shaling up a part of the section or tighter sands.

Q. Would you explain about the shale, please, how the shale lenses occur in the East Texas field and explain what influence, if any, that has on the amount of recoverable oil that can be taken out of the field in the various portions of it?

A. The Woodbine formation from its outcrop, as reflected on this exhibit number—this box exhibit, the top of it shows the outcrop of the Woodbine. From its outcrop to where it pinches out against the Sabine Uplift is variable in character. It was laid down in a shallow

316 water condition. We know that it is of marine nature because it contains marine fossils; we know that it is of shallow origin because it contains a considerable amount of lignite. The reservoir itself is—where it pinches out, is said to be pinched out against the Sabine Uplift—is a truncated portion. In other words, you have a thickness of the Woodbine there and then under sea conditions it was truncated. Now, the reservoir itself is made up of a succession of sand lenses, shale lenses and volcanic ash. The shale is impermeable and has a very low order of porosity and permeability, such that fluids would not move through it. The volcanic ash is practically of the same order of permeability and porosity. That is, it is a very low order. The sand itself is composed of—in certain portions you have the clean sorted sands; in other places the sands shale up. So generally speaking you might say that the reservoir rock is a succession of shale, volcanic ash and sand lenses intercommunicated.

The Court:

Pardon me, Mr. Cottingham, but what does this black represent?

The Witness:

May I point it out to you?

The Court:

Right there.

The Witness:

That represents a cross section through the Van field, the black portion.

The Court:

This dark red is the Woodbine sand?

The Witness:

Yes, sir.

The Court:

That is the outcrop over towards Dallas?

317

The Witness:

Yes.

The Court:

That is where you say it pinches out on the Sabine?

The Witness:

Yes, sir.

The Court:

Now, where is this East Texas field, right along here?

The Witness:

No, the other place.

The Court:

Here?

The Witness:

Yes, sir. Now, if you will take a pencil and go on up you will see that it is just across from the East Texas field. It is on top of the map.

The Court:

I see. But what does this black represent?

The Witness:

The black represents the saturated portion and the bottom of that represents the original water level at minus 3,320 feet. This Van saturation portion, that occurred above minus 2,500.

The Court:

What is that?

The Witness:

That is this field along this cross section from A to A'.

The Court:

All right, thank you.

Q. Mr. Cottingham, that box exhibit gives an exaggerated idea of the extent of the Van field when you look at it on the cross section, does it not, because the Van field is a smaller area?

A. The Van field covers approximately 4,400 acres, but the maximum thickness of the Woodbine is 650 feet. It is a very small, deep seated salt dome.

Q. Mr. Cottingham, you were speaking of these
318 shale lenses and volcanic ash lenses in the East Texas field. Are they laid down horizontally or are they generally laid down at somewhat of an angle from horizontal?

A. They were originally laid down—all sediments have a depositional gradient, but for all practical purposes the gradient is very low and practically parallel to the bedding plains within the formation.

Q. At the present time are those sand lenses horizontal or at an angle with the horizontal?

A. With reference to the reservoir?

Q. No, with reference—

A. In the East Texas field?

Q. With reference to horizontal are they tilted up? The sand is some what tilted up. Are the shale lenses tilted up in the same way in the East Texas field?

A. The shales are some what tilted up, yes, but they are not of the order of the roof of the structure because the roof of the structure is an erosional plain, or erosional surface, not a plain.

Q. Would you mind coming over here and taking a map showing the cross section of the field and show how those lenses occur?

A. The top or roof of the structure reflects an erosional surface. The bottom of the Woodbine section of the reservoir reflects more nearly a condition obtaining when the sediments were laid down. The yellow stream here is

319 the Del Rio shales which averages—it thins from west to east somewhat, but is more constant in general thickness than the reservoir rock itself.

The shales, shaled edges and sand lenses in the reservoir rock more nearly parallels the base of the reservoir than it does the north part of the reservoir. Therefore, when this truncation took place shale lenses are at an angle to the roof of the structure and intercept that erosional plain.

Q. Do the shale lenses occur regularly throughout the field or do they occur irregularly?

A. Irregularly. Any sediments laid down under water, particularly for long distances, have irregularities of shale and sand.

Q. Do you have any way of telling exactly how—

The Court:

What importance do you attach to those shale lenses? What significance do they have to you in promulgating a plan over there?

Mr. Hart:

Explain that, Mr. Cottingham.

The Court:

How extensive are they, to begin with? How big are they?

The Witness:

Sometimes they are a few inches thick, sometimes eight or ten feet thick, an impervious material. In figuring out—

The Court:

That would mean the fluid would have to find its way around it?

The Witness:

Yes, sir. In figuring out the reservoir content it would be somewhat difficult unless you had all the
 320 facts before you to know how much content you had to figure with all this mass of volcanic ash and shale lenses in the reservoir rock. That is one thing. Another thing, with reference to spacing, if one of these pronounced lenses intercepts the roof of the structure, then if a well isn't there at a particular point to penetrate that, as the water comes up, then that will be trapped in that whole structure just like it is trapped here in this large structure and it will never be recovered.

Q. In other words, Mr. Cottingham, you can't take a given cubical content of the East Texas field and say there is that much recoverable oil in it, is that correct?

A. No.

The Court:

As I understand it there have been about 25,000 wells completed over there, is that right?

The Witness:

25,000. It is almost 25,900 now.

The Court:

Have you any offhand record—I don't mean to hunt it up—but just approximately how many dry holes there are?

The Witness:

Mr. Hudnall has that.

Mr. Hudnall:

Twenty-five inside the field.

The Witness:

Twenty-five he says. We counted it up.

The Court:

Every other one in the 25,000 has been a producer?

The Witness:

That is right.

Q. Mr. Cottingham, do you have any information available which would show the location of the thickest of all of those volcanic ash lenses or shale lenses throughout the East Texas field?

321 A. No, I have not.

Q. Could you by calculating the cubical content of any area tell with any certainty how much of that cubical content is shale or volcanic ash?

A. No, you can't.

The Court:

I still don't catch the significance. I suppose it has some significance, but as I understand it the first point you make is you have to determine the amount of this shale there, the light it would throw upon the content of the reservoir?

The Witness:

That is right.

The Court:

All right. From a standpoint of conservation or prevention of waste what has that to do with it? What difference does the fact it is in there in the sand make? Does the fact that you take this oil out at a rate of twenty barrels a day or a hundred barrels a day or two hundred barrels a day have any relationship to the fact that there you have these shale lenses?

The Witness:

Yes.

The Court:

What is it?

The Witness:

You take shale lenses in tight sands, if there is a gradual encroachment of the water then the pressure is applied against that oil-water contact and there is a more general flushing of your oil around your shale lenses and through your less permeable sands.

322

The Court:

With what result?

The Witness:

What is that?

The Court:

I say with what result?

The Witness:

With a greater ultimate recovery under low rates of withdrawal than under high rates, that is one thing. Another thing with reference to the spacing of wells, with reference to getting more oil ultimately, that if you drill

your wells, if you have a general uniform spacing which—then you will get more oil.

Mr. Moody:

May it please the Court, I think your Honor has one thing in mind and Mr. Cottingham another. Mr. Cottingham is talking about a total daily field allowable. I think your Honor is talking about allocation between wells.

The Court:

You can bring that out. Have you decided whether you get bigger recovery with lots of drilling or less drilling?

The Witness:

I think you will get some more oil with lots of drilling.

The Court:

Denser drilling?

The Witness:

Yes, sir, but I don't know how much.

The Court:

You used to testify that if left to its own devices one well would drain its own tract, you didn't need a lot of wells.

The Witness:

I have some very definite views with reference to spacing. I believe in spacing that it prevents fire hazard, loss of life and property; second, it prevents blow-
 323 outs, and that is important in the State of Texas because we have several serious blowouts now. And then it affords a uniform spacing pattern and protection of the reservoir generally, and it better utilizes the gas energy in gas drive fields. And with reference to the exception to a spacing rule—

The Court:

I don't understand that the spacing rules are under a particular attack here now in this case. They are not under attack here now, are they?

Mr. Moody:

No, sir.

The Court:

What they say is that in giving them their allowables you don't take into consideration the size of their acreage or the amount of oil they have under their ground and that they can establish that they have so much more than you allow them in comparison with other people who have less. That is a very specific attack, and I don't know to what extent it is refuted by all of this enormous amount of information about the East Texas field. It is very interesting, of course, but—

Mr. Hart:

May I explain to the Court how—

The Court:

Of course I am always at a disadvantage because I have been through this a great deal, but I am not the only Judge that may have to pass on it. Two or three Judges may have to pass on it who haven't had anything to do with it, so I will let it go in the record if you want it.

The Witness:

From an engineering standpoint, if I am going to have to do the calculating and someone says "Here it is, 324 you figure it out, figure out the reservoir content and how much oil every man is entitled to," and with the data that we have to work with it is a terribly big job.

The Court:

I can understand that. All right, go ahead.

Mr. Moody:

May it please the Court, I don't want to be in the position of objecting to a question the Court asks—

The Court:

I was more or less thinking out loud.

Mr. Moody:

But we don't want to be bound by his statement that the more wells that are drilled the more oil.

The Court:

They have been disputing about that ever since I have been on the bench.

Mr. Moody:

Yes, sir, I understand. The reason we object to that being part of the record by which we would be bound is because the Courts have held that is a collateral attack upon the rules of the Railroad Commission, and I think the Railroad Commission specifically stated in one of their orders that they don't mean that the more wells that are drilled the more oil recovered, but that the more that are drilled in conformity to their spacing rules, and we just wouldn't want to be bound by that.

Mr. Hart:

Of course, part of the spacing rule is the Commission
can grant exceptions to Rule 37 to prevent waste
325 and prevent confiscation of property, isn't it?

A. Yes, sir.

Q. And under the present system of proration that assigns the allowable on the basis of potential per well, you do encourage a man to drill into an area where if

you have one of these shale lenses he will recover oil which otherwise wouldn't be recovered?

A. Yes, sir.

Q. Therefore, there is a definite relation between—

Mr. Moody:

We object to that. That is an argument of counsel.

The Court:

That is more or less provoked by the Court's questions. I was trying to direct him into a little narrower channel if I could, but I have to let them set their background if they want to.

Q. Now, you spoke, Mr. Cottingham, of the irregularities and characteristics of the sand within itself in the East Texas field. Now, are there also irregularities in the top and the bottom of the East Texas—of the Woodbine sand in the East Texas field?

A. That is correct. That is reflected in sections—the five sections—six sections.

Q. Let me mark those first. This Exhibit 27 shows a surface map of the East Texas field, and the red lines indicate the places at which these cross sections were taken, is that correct?

A. That is correct.

326 Q. There is a longitudinal section here which is shown by—what is that shown by the longitudinal line running through the field?

A. That is in here some place. That is a north-south cross section.

Q. That is shown on Exhibit 28, is that correct?

A. That is correct.

Q. And then you have taken some cross sections of the field at the various points where the horizontal lines are shown on Exhibit 27?

A. That is correct.

Q. All right. Now, the cross section A to A is shown on Exhibit 29, is that correct?

A. That is correct. That is the cross section that runs near the Rowan & Nichols Todd B lease.

Q. The cross section B to B is shown on Exhibit 30, is that correct?

A. That is correct.

Q. The cross section C to C is shown on 31, is that correct?

A. That is correct.

Q. Cross section D to D is shown on Exhibit 32?

A. That is correct.

Q. Cross section E to E is shown on Exhibit 33, is that correct?

A. Exhibit 27 you mean?

Q. The cross section E to E is shown on this Exhibit?

A. Yes.

327. Q. Now, from what were those exhibits made up, Mr. Cottingham?

A. These exhibits were made from Schlumberger logs. They reflect the top of the reservoir, the original estimated water level at minus 3,300, and where the wells encountered water, it shows at what depths those wells encountered water.

Q. Do these cross sections show or not that the top of the Woodbine sand in the East Texas field is irregular and therefore it would be very difficult to calculate the cubical content under any particular lease?

A. That is correct.

Q. Do they also show that the rise of the water level has been irregular in various portions of the field, and for that reason it would also be difficult to calculate the cubical content of the saturated sands in the portion where the water has risen?

A. That is correct, as reflected in section A-A. The original estimated level is shown in this straight line here, but the water encountered on the Schlumberger logs are

dotted as indicated here, showing that the water in this well was very irregular. Likewise in section B-B five wells encountered the water, and it doesn't show that the water is at a level plain. Section C-C shows that the water table is boned up as the dotted line indicates. There was no water—there is no water indicated from the Schlumberger logs on section D-D, but on Section E-E it shows the water level as indicated by the dotted line.

Q. You also have another exhibit here.

A. The longitudinal section shows two wells on the north end which encountered water, and the water from those wells—those wells were recently drilled wells—the water level is shown by this dotted line running in that way. On the south end the Schlumberger water level is inclined like this. The estimated original water level is indicated by the minus 3,320 foot line.

Q. You have another exhibit here taken on a cross section across the north end of the field showing the irregularity in the water level in that portion of the field?

A. That is correct.

Q. That is Exhibit 34. Now, what is this level line that is drawn all the way across the map, what is that?

A. The dark blue area indicates the portion of the—that is below minus 3,320. The light blue indicates the portion or section of the reservoir that is above minus 3,320 to the total depths of the wells indicated.

Q. What does that show with reference to the rise of the water table in that section of the field as to whether it is a uniform rise or whether it is irregular?

A. That shows that—the brown shows the penetration of each well into the Woodbine section. All of these wells are making water, so it is presumed that all of them have water at or near their total depths because they are making water. They are bound to have water there. So it shows that the water level in that area is very irregular.

329 The Court:

What section of the field is that in?

The Witness:

That is through this part right there.

The Court:

How far is that away from the Rowan & Nichols lease?

The Witness:

The Rowan & Nichols lease is here, but this condition obtains throughout this west margin where you have water.

The Court:

You have water all towards the west?

The Witness:

Yes, sir, west and north, it skirts around here.

Mr. Moody:

May I ask a question, Your Honor?

The Court:

Yes.

Mr. Moody:

Is that a cross section east and west?

The Witness:

This?

Mr. Moody:

Yes.

The Witness:

It is a cross section through this portion of the field here. That is an east-west cross section, yes, sir.

Q. Now, that is somewhat north of the Rowan & Nichols lease, is it not?

A. Yes, it is north of the Rowan & Nichols lease.

Q. Now, the water, in order to explain the point Mr. Moody asked about, the water encroaches along the west and also from the north and south to some extent, is that correct?

A. That is correct by reason of the general
330 outline of the field.

Q. This particular map shows, does it not, that the top of the sand along the western edge and along the northern edge of the field is low, and it gets higher as you go towards the south from this point and also as you go towards the east?

A. Yes; that is the structure map drawn on the top of the Woodbine sand.

Q. And the purpose of this exhibit is to show where water has come into the field it has come in at irregular levels as between wells, is that correct?

A. That is correct, and that it has not risen along in a level plain.

Q. Will you explain to the Court why it is that the water level has not come in flat like that, as a flat table, but has risen to different heights in different areas there?

A. The permeabilities of the sand have something to do with it.

Q. The presence of these shale lenses or volcanic lenses also have something to do with it?

A. That is correct.

Q. In other words, if you are going to calculate the water, disregarding your—you are going to have to disregard the actual variations as existing between tracts?

A. That is right. In other words, if you try to calculate the cubical content of this area here we would have this condition obtaining, and I don't know just how to do it.

331 Q. Now, on this Exhibit No. 35 here, Mr. Cottingham, will you explain to the Court what that exhibit shows?

A. Exhibit No. 35 is a sub-surface contour map referring to the top of the Woodbine sand. It is contoured on twenty foot contour intervals. It shows that the east side of the structure is high and the west side is low. It is an irregular surface as reflected by these contours.

Q. Does that map show all of the irregularities that would occur between tracts, or just how far—how much difference in height is there between each one of those contour lines?

A. The scale of this map, I think, is one inch, one inch equals 1,000 feet. One inch equals 2,000 feet. The contour interval is twenty feet. That is a low area and here you have a salient high area. This is a high area and this is a low area, high area, low area and high area. Here you have a projection going out here. That is a low area running in some three or four miles there. This salient sticking out here is about 3,000 feet.

The Court:

As I understand it, that is a contour of the Woodbine sand?

The Witness:

Yes, sir, it delineates the top.

The Court:

The top?

The Witness:

Yes, sir, how it looks on twenty foot contour intervals.

Q. If you tried—

332 A. If it was a plain these contour lines would run regular right down like that, but it is not a plain, it is an irregular eroded surface.

Q. If you tried to allocate the production according to the cubical content of the sand thickness of each tract of the Woodbine section, under each tract, would you or not have great difficulty in ascertaining what the top was to begin your calculations, the top of the Woodbine sand?

A. The best you could do would be an estimate of what that would be. You can't calculate an area that way accurately. All you can do is try and strike a happy average.

Q. Would that in some cases do as much—would that vary as much as twenty feet, you might be off twenty feet or possibly more than that in calculating the top of the Woodbine sand?

A. I believe a variation of the top varies thirteen feet, and there are variances in this area here which are much higher than this area here.

Mr. Tilley:

How much did you say, Mr. Cottingham?

The Witness:

I think thirteen feet the testimony was yesterday. I was taking that, that is my source of information.

Q. Well, a method of allocating the allowable on such a basis as that would necessarily be inaccurate, would it not?

333 A. It would be inaccurate. In other words, before you can figure the cubical content of your reservoir, the effective porosity, you have so many factors. First would be the top, the regular top and the regular bottom and the impervious sand and shale lenses in the reservoir itself.

Mr. Tilley:

If the Court please, in order to make an objection, I would like to ask the witness a question. Are you testifying now that there is a variation between those two sands? Is that your testimony?

The Witness:

Between which two sands?

Mr. Tilley:

Between the contours there.

The Court:

He is testifying the contour of the Woodbine sand—his testimony, as I understand it, is that it is very irregular in the distance from the earth's surface.

Mr. Tilley:

Are you basing that testimony on your actual experience in taking Schlumbergers or is it hearsay with you? Who made the map there, might I ask that?

The Witness:

Mr. Hudnall.

Mr. Tilley:

Now, have you taken Schlumbergers out there?

The Witness:

But if you will permit, I have a map that I got in confidence from a major company and they asked me to keep it in confidence, and I shall. And then we have other published reports of maps of the East Texas field, and I have very carefully checked my data with this and I find it is substantially all about the same. It is not very difficult to make one of these.

334 Mr. Tilley:

But, Mr. Cottingham, you yourself, from core examinations or Schlumberger tests or records or logs that you have been shown, you have not compared that map with those logs or cores?

The Witness:

No. Here we have records of 25,000 wells, and I don't know how many, possibly four or five hundred Schlumbergers have been run in the East Texas field. We have much better control here—

Mr. Tilley:

That is not my question, Mr. Cottingham. I am asking you have you compared that map with these Schlumbergers, the logs themselves or the cores?

The Witness:

No, I have not.

Mr. Tilley:

If the Court please—

The Witness:

I have examined the Schlumberger logs here.

The Court:

Who made that map? Mr. Hudnall made that?

The Witness:

Yes, sir.

The Court:

How did he make it? Was it made under your direction and supervision?

The Witness:

No, it was not.

The Court:

Where was it made?

The Witness:

It was made, I presume, at Tyler, Texas, but I did check it.

The Court:

Do you know enough about its authenticity to use it as a basis for your testimony?

The Witness:

I think so because I have other maps of the East Texas field, and it is substantially—they are all substantially the same.

335 The Court:

In determining the height of that Woodbine sand, you do that by these various wells as they are drilled into it?

The Witness:

Yes, sir.

The Court:

Do you have to have a Schlumberger test to do that or can you get that from cores?

The Witness:

You can do—

The Court:

Do you know you hit the Woodbine, without Schlumbergers?

The Witness:

You can get it from the driller's core because the formation is different between the Austin Chalk and the Woodbine.

Mr. Tilley:

Your Honor, the testimony puts us in a position where he can testify to those matters, but on cross examination we can't ask him questions because he will say he didn't know.

The Court:

Suppose he does? It will affect the weight of his evidence, but there is never applied to these big oil fields the technical rules which ordinarily would apply, you can't do it. What your engineers and the other engineers know about it, it is very competent learning. They go around and find this about this, well and that about this one, and then they draw their conclusions and then get a composite picture. If you are going to apply the technical rules of evidence to it you would never develop the facts with regards to a large oil field.

336 Mr. Tilley:

We didn't want to be technical, Your Honor.

The Court:

Mr. Buck, everything he testified to he didn't know of his own personal knowledge, he got it from records and what men told him and studies that had been made, and in the last analysis, when you get to trying to find out what there is down three or four thousand feet in the ground, there has to be an element of uncertainty, so I will let him testify.

(At this time a recess was taken, at the conclusion of which the following proceedings were had:)

Q. Mr. Cottingham, in connection with your testimony about the irregularities of the water in various wells in the East Texas field have you prepared a tabulation showing the total depths of the wells which are making water, and showing the percentages of those wells at the various subsea depths?

A. Yes, sir, I have.

Q. Do you have one of those schedules?

A. Yes.

Q. Would you explain that tabulation, please, to the Court?

A. This tabulation shows a break-down of the wells in the East Texas field, of 3,036 wells that are making water in the East Texas field on this date, and it was compiled from the Commission's October 1st water report, and this data with reference to water is compiled each quarter. The operators turn in data under—sworn to—and it was from that data that we got this information here. We asked them to give us the top
337 of the sand and the penetration and the total depth of the well. The tabulation shows here the total number of wells, as of October 1, 1938, making water in the East Texas field. This totalled 3,746. There was 701 wells in the total amount that we could not use because some of the operators didn't know where the top of the sand was or didn't know the total depth. All they knew was the well was making water. So this is only taken from those operators' reports who knew where the top of the sand was, the penetration and the total depth. Over on the column Total Depth all of those figures refer—are minus values, or the values below sea level. This shows that there are forty-one wells in the East Texas field producing water with a total depth of minus 3,270 feet. That is fifty feet above the original estimated water level. It shows thirty-nine wells producing at forty-five feet above the original estimated water level. It shows sixty-seven wells pro-

ducing forty feet above the original water level, and so on down. There are ninety-seven producing thirty-five feet above; 158 producing thirty feet above; 170 producing twenty-five feet above; 232 producing twenty feet above; 380 producing fifteen feet above; 422 producing ten feet above.

The Court:

You are practically reading this schedule?

The Witness:

Yes, sir.

The Court:

I have glanced at it.

338 The Witness:

This schedule was designed to show where the wells are making water. That is, it shows what the total depth is and the well is making water, we know there is water at least around these particular wells at those various levels from fifty to—as high as fifty feet above the original estimated water level. Now, below the line it shows possibly 400 wells producing below the estimated water level. In other words, on the righthand side it is a cumulative percentage of the wells and it shows—you can look across from the cumulative on the righthand side of this tabulation and see how many wells are producing or what per cent of the wells are producing above or below a certain level.

Q. Mr. Cottingham, all of these wells are producing oil, are they not?

A. Yes.

Q. And they are producing some water with it?

A. Yes, sir.

Q. And some of them are producing water from as high on the structure as minus 3,270 feet and others

are producing oil together with water from as low as minus 3,340 feet, is that correct?

A. Yes, they are producing oil and water.

Q. Then that shows a variation in the water table between these various wells of about seventy feet, is that correct?

A. I believe when you refer to a water table you refer to—well, it would be a water table.

Q. Well, I intended to say water level in the particular wells, I don't mean the water table generally, but the particular wells?

A. That is correct.

Q. It shows differences as much as seventy feet?

A. Yes.

Q. Those variations between wells as to the water level, is that due to the variations in the permeability and character of the sand in the Woodbine section that you have already spoken of?

A. That is correct, and unequal withdrawals.

The Court:

What is the last thing you said?

The Witness:

I say that and unequal withdrawals. That is, if you have more oil pulled out you will change the water table.

Q. If you have a system of proration and there is an equal spacing of wells, a general equal spacing of wells and withdrawals, that won't take place, will it, if you have a uniform spacing of wells and a system of proration allocating the production among the wells on the present basis, you cut down on that disproportionate withdrawal, do you not?

A. I don't believe I get your question, Mr. Hart.

Q. Well, you spoke of these disproportionate withdrawals. Did that take place before proration went into effect?

A. Oh, yes, much more pronounced before proration than it has been since proration.

340 The Court:

Do you mind if I interrupt him, to ask a question?

Mr. Hart:

Not at all, sir.

The Court:

I suppose you assisted in preparing this order?

The Witness:

No, I did not, Your Honor, I had no—I have prepared many orders since then, but not the original order.

The Court:

I know, but have you prepared others based on it?

The Witness:

Yes, sir, under the direction of the Commission.

The Court:

Is it your idea that you should take the total reservoir, like this, and attempt to withdraw equally from it, from all wells, without giving any consideration at all to the question of certain wells being better wells than others or whether certain owners happen to be fortunate in being in a good position on the structure, in order to get for the general public the good out of the field?

The Witness:

I think if you take it under the conditions obtaining now the present scheme is the best.

The Court:

That is what I want to know.

The Witness:

But if you had asked me that six years ago, or five or six years ago, and had I had the experience back of me then that I have now, I would have given you a different answer.

The Court:

Is it your ultimate purpose to attempt to recover from this reservoir all that can be recovered, without respect to how you recover it or who recovers it?

The Witness:

I think there should be a somewhat fair allocation made between owners, those that own more should get more, but the condition obtaining there now—

The Court:

How does your order affect that?

The Witness:

Which?

The Court:

To allocate to the respective owners the benefit of their superior position?

The Witness:

All right, the time element is going to take care of them ultimately, and in my opinion they will get substantially what is coming to them.

The Court:

By reason of the fact that they are last?

The Witness:

That is right. When you apply a common yardstick, any method of proration—across more particularly a field of this magnitude—somebody is going to be hurt, but in the ultimate the better areas will produce longer and the time element will take care of it, as evinced by the fact we have in Texas 251 wells now on a per well basis, and none of those orders have ever been attacked.

Q. 251 fields you mean?

A. Yes, sir.

Q. Mr. Cottingham, on that point the Court was just talking to you about, will you come and use the Exhibit 35, which is the structural map of the East Texas field, and show how the Rowan & Nichols lease will
342 benefit by this method of proration in that their production will be much longer than the production of other areas in the field?

A. The highest part of the East Texas field is this color, it is kind of a pinkish. Then this next highest portion is the blue along the south end. The next highest portion is the green, and you will notice there are some green just east of the Rowan & Nichols tract. The red is between contours minus 3,180 and minus 3,160. The area that is now higher, the highest portion of the field, is fast approaching a depleted condition. It is that area in which Mr. Buck referred to as making an estimate on some wells. These wells are all on the pump and our largest amount of abandonments are in that area.

Q. Explain, Mr. Cottingham, why that is going on the pumps and being abandoned even though it is higher on the structure.

A. They are being abandoned and going on the pump as reflected by this East Texas pressure map. The permeability is very low, and in as much as the motivating force is waterdrive, and it can't be transmitted to the sands on the east side there they recover the oil practically on a gasdrive situation, and the only gas in the oil originally was about 350 cubic feet to the barrel, so they will be the first to go out of the picture. Now, that condition, most of the wells that are being abandoned and most of the wells that are being placed on the pump are in this area here. They are in an area of low permeability, far removed from your waterdrive. But along here, along the Gladewater Nose, it will be noticed that the pressure gradient is almost level. There is not so very much difference in the pressure on the east side as there is on the west side. The conditions of the sands are so permeable that the water can transmit its pressure clear across in a very short time.

The Court:

Well, do you think the benefit, as I understand it, to these people is they will be able to get oil longer?

The Witness:

They will get oil longer, yes, sir.

The Court:

And now the fact is, of course, that they have reserves under their land, is it?

The Witness:

Yes, sir.

The Court:

Does that make any difference, whether they get it in a longer or shorter time? And isn't there a risk if you

drag it off too long they may be drained off to the east by other people, the waterdrive to the west coming up on them?

The Witness:

The waterdrive. I think I can show here that by the waterdrive that this will be the last area to go out of the picture in the East Texas field, and I think I can show that they have as much reserve under their land today as they originally had.

The Court:

You mean by drainage from other tracts?

The Witness:

Yes, sir. They have taken out of that twenty-four acre tract about 356,000 barrels.

344 The Court:

Where have they drained from?

The Witness:

They have drained from their neighbors to the west.

The Court:

Is that recoverable oil?

The Witness:

Yes, sir, it is just as good oil. The gas is not out of solution. It is just as mobile as when the field was in its virgin state.

The Court:

All right, go ahead.

A. Well, take the red, it shows the Gladewater Nose. This B lease is in this position, half of it is in the red

and half is in this light green. This area is structurally high. When all of the area to the north, to the west and to the south, in this manner, is drowned out by water this area will still be above the water level. And they have this tremendous area, it drains into this area in this direction from southwest-northeast. It drains from west to east, and it drains from northwest to southeast into this area, because water is heavier than oil and it will float up, not regularly, but the water table here will be more regular than it will in these places where you have varying conditions of porosity and permeability. The water level here will encroach more uniformly because of the uniform sand.

The Court:

Your idea is they are eventually going to get all their oil?

The Witness:

Yes, sir, I think they will.

345 The Court:

And by this lesser withdrawals you have here the other people will recover more of their oil?

The Witness:

That is right.

The Court:

And that there will be less of it trapped and lost?

The Witness:

I think if the field is produced at a rate of production where you have a decline that has been in effect since June 10, 1933, that you will have an ultimate recovery of something on the order—an ultimate recovery greater than you would under open flow conditions—something of the order of half to a billion barrels.

Q. Will that also be true on the Rowan & Nichols, will they get more under this system than they would under an open flow or unrestricted flow?

A. I think so, even though they have drained to themselves more than—approximately 350,000 barrels of oil to date.

Q. In other words, the amount of oil that is under their lease now is practically the same as it was when they put in their first well?

A. I have some estimates that I can show. Under the varying estimates that Mr. Rowan has given, he first estimated 45,000 barrels per acre; before the Railroad Commission 70,000 barrels per acre; his engineers 60,000 barrels per acre. And he says that he originally had 60,000 and now he has 46,000, and the difference is 14,000, which is the amount he has produced.

Q. Is that oil that is under that lease now, 346 is it recoverable oil?

A. It is recoverable oil. It is oil that has the original gas in solution. It is just as good today as it was in the virgin state of the field. It has the same, practically the same mobility, the same compressibility. We performed experiments ourselves to determine the coefficient of expansibility or compressibility of the East Texas crude, and certainly the reservoir, if no water has encroached under this 24.99 acres, the pore space is the same as it originally was and it has as much oil as it originally had except that which was lost by expansion, which is only one-tenth of one per cent for each hundred pounds pressure drop.

Q. Mr. Cottingham, if you at this time gave Rowan & Nichols, the Rowan & Nichols lease a greater proportion of the withdrawal than they are now getting, in other words disregarded the time element, would they in fact eventually get a whole lot more than their share of oil?

A. If they got from now on out a recovery of oil which was in the ratio of their recoverable reserve they

would get more than, much more than they originally had in place, much more than the original recoverable reserves were.

Q. Now, why is that? Is that because they are going to last much longer?

A. No. Because if they are going to apply a formula to get as much oil as they have under there now—they have drained from their neighbors more than
347 350,000 barrels of oil, so if you give them the opportunity to recover what is under there now they will get what they have drained into them plus what they originally had.

The Court:

That drainage proposition to them is interesting. I am not sure I understand it. Why have they drained?

The Witness:

The Bureau of Mines made a test on the expansibility of oil and they showed that for each hundred pound pressure drop that the oil expanded about one-tenth of one per cent, or a total of forty-nine-hundredths per cent for each five hundred pounds pressure drop. They have five hundred pounds less pressure today than they originally had, so the water hasn't encroached, it hasn't increased the pore space in their reservoir, there is as much oil in there today as they originally had except that which they have lost by expansion. And our Commission, Dr. Patten and Mr. Langford, checking the Bureau of Mines—

The Court:

Where does that oil come from?

The Witness:

What is that?

The Court:

Where does that come from?

The Witness:

From surrounding properties.

The Court:

Aren't they all drilled up and producing?

The Witness:

Yes, sir.

The Court:

How do they drain into Rowan & Nichols? That is what I can't understand.

The Witness:

What is that?

348 The Court:

I say how do they drain from the surrounding properties if their wells are drilled up and producing too?

The Witness:

The oil is under waterdrive. They take out some and another barrel comes in; they take out another barrel and another barrel comes in.

The Court:

They are getting it from the west?

The Witness:

Yes, sir. They have been taking out about 40,000 barrels a year, and they take out 40,000 barrels and have some more shoved into them.

The Court:

You think they are mistaken in their idea that while it occupies space it is not recoverable?

The Witness:

I just feel as certain as I do of anything in the world. I don't think your pore space has changed, I think you have the same container down there and it is full of oil today but it has less pressure than it originally had, and all the oil that they have lost, I mean all the oil that the container lost, underlying that twenty-four acre tract, is what they have lost by expansion. That coefficient of expansibility is recognized by—it was in the previous case that was first submitted, in the Rowan & Nichols case at Fort Worth, and is recognized. It is determined by a bottom hole pressure sampling bomb.

Q. Do you have that computation, Mr. Cottingham, showing what they would have lost by reason of the drop in pressure? I believe you said it was 49/100ths of one per cent of the original oil in place would have been lost by the drop in pressure?

A. Yes, I have that.

349 Q. About how many barrels, in terms of barrels of oil, would have been lost by that drop in pressure?

A. The three estimates that Mr. Rowan gave, one at Fort Worth in 1933, 45,000 barrels of recoverable oil per acre; the one before the Commission at 70,000 barrels was made in 1938, and the one that was made day before yesterday was for 60,000 barrels per acre, from this 24.99 acre tract. Those estimates vary over the original. The 70,000 is 55.5 per cent greater than his estimate in 1933; his engineer's report made yesterday is 33.3 per cent greater than his original estimate of the recoverable oil under that tract. Now, he has produced, according to our figures, 14,332 barrels per acre from this

lease. The recoverable oil—under the first estimate the total recoverable oil would total 1,124,550 barrels and his production was 358,159. Under the 70,000 barrel estimate the total recoverable oil would total 1,749,300 barrels, and to subtract his amount of production to date would leave him 1,339,000 barrels. Under the 60,000 barrel estimate he would have a remaining recoverable oil of 1,141,000. Now, if the oil originally had an expansibility—I mean if the oil originally in place under the first estimate was 1,124,550 barrels then he has that many barrels under his lease today except what he lost by expansion, and the expansion factor is, for 500 pounds

is 46/100ths per cent, then the amount that he
 350 has lost by expansion for the first estimate totals—this is based on a fifty per cent recovery factor and Mr. Buck used a seventy-five, and I will have to vary these figures to conform to Mr. Buck's recovery figure, and it will be slightly more, possibly a thousand barrels more, but the loss under the first by expansion is 5,172; and the loss under the second estimate, 70,000 barrels, is 8,047 barrels; and the loss by expansion under the 60,000 barrel estimate is 6,897 barrels. Now, that shows that this tract has drained from other tracts under these various estimates these amounts respectively under the different estimates: 359,987 barrels; 350,112 barrels; 351,262 barrels. Or in rough figures they have drained from other tracts approximately 250,000 barrels.

Q. How many, 350,000?

A. Yes, 350,000.

Q. I believe there is an error in subtraction on that first estimate, isn't there, Mr. Cottingham? It ought to be 353,987.

The Court:

Do you think that all comes from the west?

The Witness:

I think it comes from the west for this reason, you can't have flow in the reservoir—you can have flow-age only from high pressure to low pressure.

The Court:

Well, is there a drainage going from them to the east?

The Witness:

Yes, the same drainage east of them that there is west of them.

351 The Court:

Then how do they stay stationary?

The Witness:

What is that?

The Court:

Do they stay stationary because they are getting as much from the west as they are losing to the east?

The Witness:

That is correct.

Q. Mr. Cottingham, they are not only getting as much from the west as they are losing to the east, but also the sum total of what they are losing to the east and what they are taking up above the ground themselves, isn't that correct? In other words, in the loss, what they are taking out plus what may have been drained from them to others, has it not been supplanted by what has been drained to them from other tracts?

A. That is correct.

Q. Then there has been a net gain over this period of about 350,000 barrels?

A. Of recoverable oil.

Q. Now, where they have been drilled to a greater density than the surrounding tracts, they have created in their particular tract a low pressure area, and for that reason have drained oil to their tract from all directions, have they not?

A. Mr. Hart, the area is so permeable that the low rates of withdrawal doesn't create low pressure areas.

Q. I see. Does it create a differential in pressure at the time of production from those wells?

A. It does. Any withdrawal creates a differential.

Q. Now, Mr. Cottingham, you said that the water would be coming in from the west and north and south and the Rowan & Nichols area would go out of production last. Would that, in fact, emphasize that if the water level instead of rising horizontally like that the water table would rise as Mr. Buck said yesterday, somewhat at that angle as it came up the structure?

A. That is right. We took from our cross section map that was constructed on Schlumberger logs and calculated the top of the Woodbine on that well. Their wells are around minus 3,380, giving them a five or eight foot leeway to work on. If the water encroached on a perfect plain then there would be only about thirteen per cent of cross section that would be out of the water when the water reached them. It would be less than thirteen per cent.

The Court:

You understand, in asking you these questions I am not intimating any views. I am simply trying to ventilate the matter. I would like to get your views. Now, if you could operate that entire field as under one ownership, or for instance say it belonged to the Government, then it might be well to withdraw it the way you are doing it, but what I would like to know is this, do you,

In your ideas, pay any attention at all to the respective positions of the parties as to whether one of them happens to be in a better position or not, has a better piece of acreage? That is a pretty large piece of land we are dealing with there, and if one fellow happened to have a good well and another man a poor one, one man a thick sand and another man thin, one had water and another no water, do you pay any attention to that at all in your ideas as to how you are going to let him get it out? Or are you only taking into consideration the ultimate result, that we will get out for the public all we can out of this kind of a pool? Did I make my question clear?

The Witness:

I think so. You know it is hard to answer that question, but we are faced with the proposition that it is practically on a per well basis.

The Court:

Well, that is what it looks like to me. The percentage that you allow the better, bigger wells is so small as to be practically negligible; and you are up against the same thing you were in the prior cases. You have had a per well basis order before and it has been invalidated before.

The Witness:

We have 251 fields—

The Court:

I mean in the East Texas field.

The Witness:

Yes. There have been some per well allocations in the East Texas field. Now, in answer to your question,

the only thing that will take care of these various tracts on a per well basis is the time element and for one thing—

354 The Court:

You don't think there is any particular right in it, a right to get your property out and own it within a reasonable time? They have to look forward to a period of thirty or forty or fifty years to finally realize, is that the way you approach it?

A. Well, it might mean that. The longer life—the longer life fields will be forty years. I am quite sure that we will have production here, even though it is flooded with water as we have many fields today, the water has risen clear to the top of the sand and it is a matter of pulling out the water and flushing the scum of oil out.

The Court:

Why, in promulgating these orders, why is it you let all the little fellows, anybody that can make as much as twenty barrels—

The Witness:

We have—

The Court:

Understand, I am not arguing, but I want to understand the philosophy of the thing. There may be a very good reason for it.

The Witness:

We have a marginal well statute that sets a limit by depth of ten, twenty, thirty, thirty-five, with which you are familiar. Now, we reach the proposition that in Texas we have about 34,000 wells that will make less than the marginal well allowance. Then we have about 51,000

wells that will make the marginal allowance, and then some 34,000 flowing wells in Texas. Now, when we take all of the—all that those wells will make, those 34,000 and then take the marginal allowance and sub-marginal allowance together it gives us a figure which approximates our entire market demand. Now, 355 that occasioned the shutting down of Saturdays and Sundays.

The Court:

Now, approaching it from a waste standpoint, and that is the reason for this regulation. Take a well, for instance, that could make nineteen or twenty barrels, that would be regarded as rather a poor well over there, wouldn't it?

The Witness:

That is very poor.

The Court:

Now, would there be any waste if you cut that fellow down to five barrels, say?

The Witness:

I wouldn't be competent—

The Court:

I mean would it hurt the structure?

The Witness:

It wouldn't hurt the structure.

The Court:

Would it tend to drown it out?

The Witness:

It might cause premature abandonment of that particular well and cause a loss of ultimate production.

The Court:

Well; is that necessarily true? Wouldn't he be draining it to some other well that would produce it if he didn't produce it?

The Witness:

Generally. It might be that most of the oil—it is owing to the general conditions in the bore of that well. It might practically all be drained into some other well.

The Court:

Then from a waste standpoint there is no reason for giving an arbitrary allowance of twenty barrels, they could be set back in their relative position?

356

The Witness:

But I don't know what that level would be.

The Court:

Well, for instance you take a well that is capable of making twenty-three or twenty-four thousand barrels a day and you give it an allowable of twenty-two or twenty-three barrels a day, a fractional per cent of what it will make. Then right next to him you give a little well that can't make but eighteen or nineteen barrels a day an allowable of eighteen or nineteen, if it can make it, or twenty if it can make it. Now, what I want to know is how do you justify that?

The Witness:

You might justify it from this standpoint; any common yardstick you apply is going to work a hardship against certain operators, but if you give a spread in the East Texas field, permitting a high for the very smallest

well, and then you are going to have to bring up the field outlet to give a spread between the poorer well and the best well in the field, and then there will be a tremendous waste of oil.

The Court:

You can't give it a spread there because this big well is too big, you have to cut it down a whole lot, of course, to stay within your total allowable, but what I was trying to get at was why do you keep them so close together? One well worth almost nothing you let it make twenty barrels a day, and here is one that will produce a huge amount and it can make only twenty barrels, approximately, a day; approximately twenty-two or twenty-three barrels at the most. Now, just without any technicality about it, from first blush it looks wrong.

357 I am sure you have reasons for it. I am sure it is a matter that you have been thinking about a long time. And that is what I want to see is how you justify it?

The Witness:

You have to first, in looking at it from the State's standpoint, see if the field can produce under a certain rate with a minimum amount of waste. That is the overall picture.

The Court:

Yes.

The Witness:

Now, when you set that—

The Court:

I understand the other people don't disagree with that, they agree that ought to be done.

The Witness:

Now, with reference to the allocation between wells or between tracts, that is the problem that we are faced with. The picture is just as it is today. I don't know how to remedy it just exactly.

Q. Mr. Cottingham, by reason of the way this scheme works in practice do the best tracts actually get a greater recovery than the poorer tracts, a greater ultimate recovery?

A. That is right.

Q. Is that true in the case of Rowan & Nichols?

A. That is particularly true with Rowan & Nichols.

Q. And is it generally true throughout the field that the better tracts will get the larger ultimate recovery?

A. I think that is true that the better tracts will get—the better wells will get the most oil.

358 Mr. Tilley:

We object to that as being a pure conclusion of the witness.

The Court:

I have asked him for his opinion and conclusion for two hours. He is an expert.

Mr. Tilley:

He asked him a thing that on its face—

The Court:

A man that has been handling this business for years—and he is trying to do it the best he can—and the only thing we are interested in is are they doing the best they can to avoid confiscation.

Q. Mr. Cottingham, do you have situations in the East Texas field where you would have two wells right

close together, one a very poor well and one say that was among the highest potential in the field? Don't the wells as a general picture grade off from the poorer wells along the edge to the better wells in the Fairway?

A. That is the general condition. There are exceptions to that.

Q. The areas where you have the poor wells will go out of production first, leaving the better areas to produce longer?

A. That is correct.

Q. And not only will the better areas produce longer at the present rate, but as the poorer wells on the outside give out the better wells will have their per well allowable increase, as the poorer go out?

A. The per well allowable will increase. I
359 think for two reasons. That you will have wells going clear out of the picture on the east and west sides of the field; then you will have wells that will not be able to make their allowable and those wells located along the longitudinal center all can be afforded a greater allowable when that condition obtains.

Q. In other words, in figuring out how long it is going to take them to get their recoverable oil you have to take into consideration there will be an increased allowable to the better wells in the Fairway?

A. Yes, sir.

Q. Now, the west side wells have to get their oil now if they are going to get it, if they are going to get any of their oil in place at all they have to get it now before they are drowned out?

A. If they don't get it now they certainly won't get it.

Q. They won't get it at all?

A. If you produce this field like a waterdrive field, controlled waterdrive where you pump the water down and flushing the oil ahead of the water, if you would

produce along a contour this way until you produce all of the oil and let the water encroach, then when you deplete that contour go on up to the next contour and let the oil flush right up you would have, in my opinion, a greater ultimate recovery.

Q. But that would deprive those persons to the east of their structural advantage, would it not, by reason of that fact, the fact that oil naturally will be pushed up to the west to them?

A. I believe if you had started it earlier that
360 would give just about everybody his oil under his land if the withdrawals were regulated to a uniform spacing.

Q. If you cut the wells down, these marginal wells down to below a minimum say of fourteen or fifteen barrels per day would that or not, especially on the west side where there is a lot of water produced, would that cause the wells to be abandoned?

A. Fourteen, they are that now.

Q. Yes, sir, if you reduced that marginal amount below that would that or not cause wells to be abandoned, plugged and abandoned?

A. Prematurely?

Q. Yes, sir.

A. That is correct, certain wells. Now, let me qualify that statement.

Q. All right.

A. It might be that a well would be capable by putting a high pressure or casing pump or Reeder pump on and producing high quantities of water, you might get just one-half of one per cent water—of oil and the rest water and still it would be unprofitable to produce that oil.

Q. The people wouldn't operate the wells if they got it so low they couldn't operate and pay the costs of operation, would they?

361 A. No, they don't stay in business if they can't make something out of it.

Q. If you cut them down below that they will lose the chance to get the oil under their tract, wouldn't they?

A. They will lose it.

Q. Furthermore, there will be some oil trapped, not driven out, and will not be ultimately recovered?

A. Under water drive I think most of the oil in a highly permeable area will go on up dip, but if it is not a homogeneous condition some of that oil will be trapped and a few more holes will get a little more oil.

Q. Furthermore, you spoke of these sand lenses, I mean these shale lenses and volcanic ash lenses that extend through the Woodbine sand. In cases where those come down near the western edge will the oil flow to the east or be trapped in those lenses up against the top of the sand?

A. Where you have irregular conditions of the roof of the structure or you have little humps, if the water table rises up there, if there isn't a well to puncture at that place that oil will be irretrievably lost.

Q. In other words, oil in situations like that, along the west side will be lost until you allow the parties on the west side to draw out the oil through wells?

A. There will be some more oil recovered by permitting the wells to get the maximum amount of oil per well under waterdrive conditions.

362 Q. I believe that the estimate is that there have been about 16,000 wells drilled in the East Texas field while this proration system has been in effect, is that correct?

A. I think that is just about the figure.

Q. Many of them on the west side and many of them on the east side where they are pumping, are they not?

A. Yes, that is correct. And a great many wells have been drilled extending the field since that order has been in effect, feeling out the margins of the field.

Q. And if you cut those walls down to such a point that they can't operate the wells they are going to lose the money they put in those wells?

A. That is correct. Now, if you will note about these wells sticking out on this salient here, if these wells hadn't been drilled I don't think that oil would have gone up dip because there is a sand lense that intercepts the roof of the structure and that little area there possibly has a water level all of its own, and it is just a little miniature East Texas, like the entire area has a water level, that little area has a water level of its own, and it took a well or wells to get it.

Q. Taking it as an original proposition, if there had not been a law and regulations which allowed marginal withdrawal to wells along the west side of the field, would those wells have been drilled and that oil recovered at all?

A. Up in a good many sections, this area here and here, we know that, because the water table up there, they are producing oil below the estimated water level.

That clearly indicates that they have a different water level from the main part of the structure, it is just an isolated sand there.

Q. In other words, Mr. Cottingham, is there a justification of a marginal allowance as a means of prevention of waste?

A. I think so.

Q. And taking the marginal allowance into consideration under the present method of proration do you give to tracts that are more advantageously situated the benefit of their advantage on the structure?

A. That is correct.

The Court:

I don't understand your answer. How do you give to them an advantage?

The Witness:

There is, as I previously stated—the field is practically on a per well basis, there is about 7,000 barrels distributed to those wells in the Fairway.

Q. Will the amount of the proratable surplus above the marginal allowance, allowable, increase?

A. It should increase.

The Court:

Didn't the evidence show about sixteen or seventeen thousand barrels?

The Witness:

What is that?

The Court:

Didn't the evidence show about sixteen or seventeen thousand barrels proratable oil?

The Witness:

I think it is around 7,000.

Mr. Moody:

7,000, Your Honor.

The Witness:

I think it is 7,000.

364

Q. Does that take into consideration what the marginal wells are assigned to them that they don't make?

A. Yes, that is the amount that is allocated above the twenty barrels to certain wells.

The Court:

As I understand it, to make it clear in the record, you say that it is practically on a per well basis. If a well

can't make twenty barrels, then whatever it failed to make is allocated to other more fortunate wells that can, is that right?

The Witness:

First the field has been given a top allowable.

The Court:

Yes, I know.

The Witness:

And then the ones that can't make twenty barrels are given that and then the rest of it is assigned to those that can make twenty barrels, and then the remaining portion above twenty barrels is assigned to the better wells in the field.

The Court:

On a potential basis?

The Witness:

On a potential basis.

The Court:

The result of that is some of them make twenty-two or twenty-three or twenty-four barrels, but none of them run out of the twenties? There isn't any well that runs thirty?

The Witness:

No, the highest well in the field is about twenty-five barrels. And we are beginning to get a lot of wells—we have 437 wells that averages eleven barrels—457 barrels—457 wells that can't make twenty and they average about eleven barrels.

The Court:

That deficit is allotted to the better wells on a potential basis?

365 The Witness:

Well, in effect it is, but the submarginal, referring to wells that can't make twenty, are allocated all they will make; then all the other wells are allocated twenty barrels and then the top allowable of the field, the difference between what the submarginal and marginal allowance is is 7,000 barrels, which all three of those totals the field outlet.

Q. And do you say, Mr. Cottingham, that the amount to be prorated among the better wells will or will not increase as time passes?

A. It is my opinion that as time passes that the Fairway will come into the picture and be allocated a larger allowable as the field becomes more and more depleted. The drilling has dropped off considerable. We have figures on that with reference to the field such as drilling wells and exceptions. The permits are less and less.

Q. In other words, there will be fewer wells to divide the oil between, is that right?

A. The loss of production by dead wells and wells incapable of making the allowable will come to a point and offset the new wells and finally the dead wells and those that can't make their allowance will go out of the picture and a greater allowable can be assigned to the better wells.

Q. And in that way they will be given the advantage of their structure and you will be giving an advantage to the better wells?

A. That is correct.

366 Q. Under any system of allocation if you prevent the loss of their property by those persons having marginal wells or submarginal wells—

in other words, if you make a marginal allowance and you keep a top allowable which they conceded to be about right, under any system of allocation would there be much spread in the marginal wells and top wells?

A. No, there would not.

Mr. Tilley:

Now, Your Honor, is the Court going to permit him to testify to the fact that he or his operator should be given so many barrels of oil to recover his investment? Is that the effect of your question, Mr. Hart? If it is we want to object to it because we submit that is not admissible. It is entirely irrelevant and immaterial.

Mr. Hart:

Our position is this Commission has to consider not only your property but all the operators in the field who have drilled in good faith and in reliance on the orders.

The Court:

What do you contend to be the genesis of the right to regulate this at all? Do you predicate it on waste or do you claim also a question of drainage?

Mr. Hart:

We predicate it on waste. We say the top allowable is fixed on that basis, and we also say the marginal allowance is predicated on waste. After that is taken primarily into consideration then the Commission
367 has to try to formulate some method that will with reasonable fairness allocate that total production among the owners in the field. Our position is that the present method of allocation does that.

Mr. Tilley:

Your Honor, we submit that if the Commission grants three permits for three wells on a one acre tract it may

have the right to do that, but in doing so it does not have the right to do it except for one purpose, if any purpose, and that is to recover the oil which they say otherwise would not be recovered under that tract. Now, if their purpose is, and it is unquestionably, to show that that second and third well have to be paid for out of the additional oil to be recovered from those wells, and naturally to be recovered from other tracts, then we submit to Your Honor that it certainly is not admissible and we object to it.

The Court:

I don't think there is any materiality in that. When we first started out on this regulation business it was sustained purely as a waste measure and it had to have some relationship to waste, otherwise the owner could produce whatever oil or gas there was under his land and take it under the capture doctrine. There have been some slight departures from that in these gas cases. Now, I don't know whether you think the statute here is broad enough to do that or not with regard to oil. Heretofore they have only been sustained regulations in the East Texas field on the theory that they prevented waste. The question as to whether a man is going to recover his capital investment has nothing to do with waste.

Mr. Pollard:

Your Honor, we contend that primarily these orders are promulgated and enforced for the purpose of preventing waste, and then when they have done that we allocate that allowable production in a distribution fashion as equitably as possible, bearing in mind the primary measure of preventing waste. Now, our position is this, that during the period of time that this proration order, the present method of distribution, has been in effect, that for the purpose of preventing waste there have

been something like 15,000 wells drilled. Each of those wells has then become a vested property right in the various owners of those wells. Now, if we cut the allocation of all of those wells down to a point where they would have to cease production as an economic matter, then there is a physical waste angle, there has been actual physical waste caused. And in addition to that there has been a deprivation of property rights invested by those individuals under the proration order which has been in effect for longer than a five year period. So there would be the double-edged effect not only of actually causing physical waste to cut the minimum allowable down, but there would be the other effect of depriving these people of their investments during the period of time Mr. Rowan and others permitted this order to remain in effect, during the time they made their investment.

369 Mr. Moody:

Does the Court say that the Railroad Commission can fix the allowable so as to enable a man to recover his investment in a well he wanted to drill, that he thought he could make money out of, and things turned out that to operate it it would turn out to be a loss?

The Court:

I don't think that has anything to do with it. As I said a moment ago, the very inception of this idea that the State could regulate a man in producing oil or gas lay in the fact that it is one of the natural resources of the State and it could do it to prevent waste to the detriment of the people of the State generally, and if your regulation didn't have any relationship to the prevention of waste then you have no right to interfere with him, he could do what he wanted to with his oil. And it has been upon that theory that most of the East Texas cases

have been tried out. Now, in the gas cases, of which we have had a good many, one of the statutes recently, related to sour gas, has attempted to control the matter from the standpoint not only of preventing waste, but to prevent draining. And in an opinion Judge Hutcheson wrote last summer, I sat on the Court and he delivered the opinion, that statute was sustained. Now, there has been no such statute passed with regard to oil, has there?

Mr. Pollard:

No.

The Court:

You are familiar with what I am talking about?

370 Mr. Pollard:

Yes, sir, that is a correlative right statute.

The Court:

No, the correlative right statute was stricken several times because it didn't comply with the constitutional requirements.

Mr. Pollard:

The Henderson case is the one you had in mind.

The Court:

This last Henderson case, the Panhandle Gas case.

Mr. Pollard:

Yes, sir.

The Court:

And then finally they got into the statute where it related to sour gas the matter of drainage, and that was sustained. Now, I want to know just as a matter of in-

formation as we go along if that order is completely a waste order or does it have the—also have the idea you prevent—

Mr. Pollard:

It is a waste order, Your Honor.

The Court:

Purely waste?

Mr. Pollard:

Yes, sir.

The Court:

All right.

Mr. Hart:

If the Court please, I think it should be pointed out that the statute requires that when the Railroad Commission finds that waste is taking place or is reasonably imminent the Commission shall make such rule as shall prevent waste or tend to correct or lessen waste, and that upon that finding the Railroad Commission shall distribute pro rata or otherwise a portion or allocate the allowable production among the various producers on a reasonable basis. That is the reason

371 I said after we determined what the total is on a waste basis and then determine what a marginal allowable is on a waste basis, then you have to distribute the rest on a reasonable basis because the statute says that.

The Court:

Well, I suppose the concept that you have the right to limit the top allowable involves the idea that since you have interfered with the rights of the parties to that extent you must reasonably apportion it between.

them, and that is the crux of the matter, whether there has been a reasonable apportionment, what must be considered in arriving at that reasonable apportionment.

(At this time a recess was taken, at the conclusion of which the following proceedings were had:)

Q. Mr. Cottingham, I believe that you were pointing out before the recess certain areas where because of sand conditions unless the wells had been drilled there would be oil which would not be recoverable. Now, would you point out those areas?

A. Around the margin of the field we have areas that are producing below the estimated water level. Of course that oil would not be drained if there were not wells there because those little sand lenses have special water levels of their own, somewhat comparable to the water level of the entire East Texas field structure, and if you didn't have a well there the oil would not be
372 drained up dip by water drive because it would be trapped and there would be no way of flushing it out to the east.

Q. If those wells had to be abandoned, plugged and abandoned, would that oil be recovered from other wells?

A. It would be irretrievably lost.

Q. Do similar situations exist in other parts of the field?

A. As the water encroaches from west to east you also have sand lenses intercepting the roof of the structure, and if there is not a well there to drain that oil it likewise will be irretrievably lost; it will not be recovered, in other words.

Q. If the marginal allowable is below the amount required to pay back the expenses of drilling the wells then those areas will not be drilled and the oil will be lost, is that correct?

A. A certain portion of the oil will be lost, that portion that will not be flushed up dip, and there will be some that will not be flushed up dip by waterdrive unless those wells are permitted to produce.

Q. Mr. Cottingham, would you state the factors that enter into the productive capacity of a well? Would you state the factors that enter into a consideration of the productive capacity of a well?

A. To produce?

Q. Yes, sir, to produce oil.

A. Permeability, porosity, sand thickness and pressure and possibly position on structure in the East Texas field.

Q. Now, with reference to porosity are there
373 variations in porosity between different parts of the Woodbine sand and other parts of the Woodbine sand?

A. Great variations in porosity.

Q. Could you tell us the limits of that variation, between what percentages of porosity exist?

A. All of that information, Mr. Hart, is not available to the Commission, a great deal of the history of the East Texas field is not available to the Commission.

Q. Well, from what information you have could you state roughly what that variation is?

A. I have here before me laboratory tests which were submitted by various companies showing the amount of porosity and its range in values and the average values which we calculated from those various laboratory tests.

Q. Is that part of the information that the Commission has at this time?

A. Yes. It covers only twenty wells; and incidently I would say that the information covering these twenty wells takes a great deal of laboratory experimentation to determine even these twenty, but this is available to us with reference to giving us a general idea within the variance between porosity and connate water and the

amount of shale and impervious sand of the twenty wells.

Q. Where were those twenty wells located, in the same general vicinity?

A. Located throughout the field. The Commission doesn't have a laboratory for determining porosity tests. That is a long and laborious task for even one well. If you take and determine the porosity from top to bottom of a core in a hundred foot section it takes quite a number of days to do that, to determine whether or not this section has this amount of porosity and this section has another amount and so on and so on for a hundred feet.

Q. Do you find marked variation in porosity in the same well?

A. In the twenty wells submitted to us we have an average value of porosity from those twenty wells.

Q. Now, my particular question is do you find variations in porosity in the same well?

A. There is a variation according to these samples of 13.9 per cent to 30.6 per cent in porosity. That is, the range of porosity is between 13.9 per cent to 30.6 per cent in the effective portion of the section.

Q. What do you mean the effective portion of the section?

A. That portion which appears to be saturated with oil.

Q. Will there be portions of the Woodbine sand that are neither saturated with oil nor with water?

A. No. A certain portion of it is impervious to oil.

Q. In other words it won't be saturated with either liquid?

A. In other words the Woodbine formation—I mean the reservoir rock as we know it now was one time filled with sea water, and due to the migration of oil and gas, in this case it appears to be oil because it is undersaturated, there is no free gas except in the south end which

possibly is cut off by a fault. This oil migrating up dip by reason of its difference in specific gravity and other factors, displaces water. It doesn't displace all of the water, it displaces only a portion of the water, and that portion of the pore space that is filled with water, that is called connate water, and then there is—the effective porosity, of course, contains some oil displacing the water and filling the pore spaces with oil, so today we find that in the reservoir the pore spaces are filled with oil and water in varying percentages and we find that the porosity, to your question, varies from 13.9 per cent to 30.6 per cent, which includes connate water and oil.

Q. Now, are there variations in permeability even where the porosity is the same?

A. Permeability and porosity, there is no relationship. You might have in a sand, as Mr. Buck explained yesterday, you might have the same condition, you might have an equal porosity, but permeability is a measure of the ease through which fluids flow through a medium and there is no relationship between porosity and permeability. That is, you might have very fine sand which offers a great resistance to the flow of liquids, including gas, through fine sand, but the question is you might have the same porosity in one case as you have in another but you would have a great deal higher order of permeability and the fluids might move through basket balls faster than it would BB shots because it has to go over more space.

Q. Are there variations in the amount of connate water which is to be found in different sections of the field?

A. A variation of connate water, which is the original sea water that is held in these small spaces by capillarity, the variation runs from 9.69 per cent to 28.7 per cent.

Q. Are there also variations in the effectiveness of the sand, that is, the saturated section of the sand?

A. The variation is from zero to less than 120 feet. I don't know how much in the Fairway is effective because you would have to take out the impervious shale, you would have to take out the impervious volcanic ash in order to get the amount of section that was saturated, first.

Q. What are the variations in permeability in the East Texas field?

A. I haven't that before me, but it ranges from practically zero. You take ordinary shale, it doesn't permit fluids to pass through it, so you might say that that is zero and then of course you have a gravel which might have a permeability factor of 300—3,000 millidorsals or more, a great deal more than that.

Q. Now, because of those variations which exist, Mr. Cottingham, is it possible to calculate accurately, without actually making a test by seeing how much the well will produce, is it possible to calculate mathematically what the productive capacity of a well is? Can you calculate the sand thickness and the porosity and

377 permeability and all those other factors that go into it, or would that be so uncertain under the information that you now have that you can't obtain substantial accuracy?

A. The Railroad Commission has so far as I know only these twenty laboratory tests where they have examined the cores minutely. Now, with reference to Schlumberger logs, all the Schlumberger logs is not turned into the Commission. We never have a Schlumberger log turned into the Commission unless it is a special hearing where it is to prove a certain point in a new field or something like that. I recall no time that we have ever had a Schlumberger log turned into the Commission to explain any conditions that exist in the East Texas field until this suit was filed. Then we made an attempt to acquire all the Schlumberger logs that we could, and I think now we have upward of 200, but they

were collected from one source and from an agency that had made an effort to get as many Schlumberger logs as they could to study the variable conditions of the East Texas reservoir, but so far as all we have to go by, from records that are required by law, is the driller's log.

Q. Well, from the information that you have available could you accurately ascertain the productive capacity of a well by just sitting down and calculating mathematically these factors?

A. Well, the only way to calculate productive capacity or the ability of a well to produce is to let it produce.

Q. That is what I am getting at, you can't
378 sit down and figure it out mathematically. The only way you can find out what the combined action of these different factors is is to let the well produce, isn't that right?

A. You have four or five factors. You have permeability, porosity, sand thickness and the pressure and possibly position on structure. The proximity to water, that enters into the factors as to the ability of that well to produce, and that is the proof of the pudding.

Q. What is?

A. Just let it flow and see how much it will make.

Q. Well, is that what you do when you take potential tests on wells?

A. That is correct.

Q. What factors, then, does a potential test reflect?

A. It reflects porosity, permeability, sand thickness and pressure and in relationship to the water that maintains that pressure and possibly position on structure or its relationship with reference to the water level. I am not particularly clear on that point.

Q. Now, of course, Mr. Cottingham, the potential doesn't indicate the acreage in a lease or anything of that kind, does it?

A. No.

Q. If a man wants to have his lease drilled up as densely as his neighbor he can apply to the Commission for a permit to drill under Rule 37?

A. Yes.

Q. But except for the acreage, then all of those
379 factors which would go into determining the recoverable reserves are reflected in the potential?

A. Potential is reflected in reserves of the recoverable oil. Before you know whether you have good oil land or bad oil land you first have to have a well. Then the next thing you take into consideration is its ability to produce.

Q. Now, Mr. Cottingham, in trying to find out what potentials should be assigned to the wells in the various areas in the East Texas field what system did the Railroad Commission adopt for the purpose of finding that out?

A. I don't believe I get your question, Mr. Hart.

Q. What method did the Commission use in trying to find out what potential it should assign to the wells in the particular areas of the East Texas field?

A. The map, I don't know what exhibit that is, if you will refer to it.

Q. It has been marked as Exhibit 38.

A. Exhibit 38 shows seventy-one key wells in the East Texas field that was flowed for two hours. The first hour they flowed the wells in order to condition the wells and get them in good flowing condition. Then the oil was measured. The second hour the well was flowed the oil was measured and that represents the potentials of those as reflected on that map, the second hour's potential of the ability of those wells to produce, during the second hour, under uniform conditions. That is, the
380 restriction was that those wells were to have seven inch casing; that there was to be two flow lines from the casing of four inches in diameter; that there was to be one flow line from the

tubing of four inches in diameter. There was no restriction on the size of the hole below the casing.

Q. In other words, the Commission tried to have the test taken under the same mechanical conditions in the wells?

A. That is correct, so that they would reflect the ability of those wells to produce under those uniform conditions.

Q. Now, after those tests were taken were those wells placed on a map and contour lines drawn on a map similar to the one which is there on the board as Exhibit No. 38?

A. That is correct with this exception, those seventy-one wells were spaced within the productive limits of the field. The heavy dark line on the map represents the approximate limit of production or where the Woodbine sand is at approximately zero in oil saturation. Now, that zero line was determined by some 250 or 300 wells. That line was drawn between dry holes on the outside of the productive limits and producing wells within the productive limits and that line is the result of between 250 and 300 wells. That was the zero line. That, for all practical purposes, was the line where you would expect the production to be nothing or a slight few barrels. Of course we have had to change that line from time to time because as previously pointed out, you encountered production beyond those limits in areas which had not been fully defined
381 by drilling when the original map was made or by reason of these sand lenses intercepting the roof of the structure, causing production to be beyond the limits of the general reservoir; that is, those little isolated lenses having different water tables from the main reservoir.

Q. In other words, in some cases you got producing wells where there previously had been drilled dry holes?

A. What is that?

Q. In some instances you would get producing wells outside the area where previously dry holes had been drilled?

A. Yes, sir.

Q. After those tests were made, explain briefly how the contour lines were drawn.

A. The contouring of this map after the productive limits of the field was determined, the zero limits of the field was determined, we took those key wells and contoured this map mathematically in geology. Sometime when you are in a particular geological province and you know the force, the particular tonic forces that cause structural folding; you extropulate, but so far as this map is concerned itself, in order to avoid any criticism by any operator, it was contoured mechanically, that is, between zero, the zero line and any well the contour lines were spaced equally with reference to zero and the capacity of that well to produce per hour. The interior wells were contoured the same way. In all of the interior wells the

spacing was accurately measured by an engineer's
382 rule and the contour lines were spaced according to the ability of one well as to the ability of another well. So you might say that the map was contoured mathematically so that there would be no discussion as to the personal equation entering into the contouring of the map.

Q. After those original tests were made were some additional tests made at the requests of operators for the purpose of checking on the results you obtained?

A. Yes. The first map as adopted by the Commission I believe it was February 1, 1935. Soon after I assumed the capacity that I now occupy. There was sixty-seven wells. The present map reflects seventy-one wells. After the first map was made and adopted by the Commission the Commission invited any operator that felt aggrieved by reason of his potential to have potentials made. In pursu-

ance to that request of the Commission there has been an increase from sixty-seven to seventy-one wells.

Q. Have other tests been made in addition to those you have spoken of on individual wells in order to ascertain their potential?

A. What is that?

Q. Have other wells besides those you have spoken of been made—potentials—on individual wells to check on their potential?

A. Not officially, and I don't know of any. The Commission was already ready and willing to have a potential test made to determine the potential capacity of a particular area.

Q. Now, also on that map there are some other circles drawn. The red circles, I believe, are the potential key wells?

A. The red circles are drawn in diameters of quarters and the red circles I can't—~~the~~ yellow circles I can't see them from here. They are smaller, but they represent the ninety-one key wells which are used monthly in the bottom hole pressure surveys.

Q. From the tests made on those bottom hole pressure key wells do you determine the pressure in the field according to the chart that you previously testified about?

A. That is right, monthly, for this reason, as water encroaches pressure declines due to mass production, and I mean, by mass production I mean volumetric withdrawal with reference to oil, water and gas, and in order to tell something about the decline under a certain rate of production it is better to take those bottom hole pressure surveys once a month and make your adjustments accordingly to reach that point of critical rate of production where you can produce the field with the least possible physical waste.

Q. Now, Mr. Cottingham, would you please step over here. I would like for you to look now at Exhibit 39.

A. Yes, sir.

Q. Mr. Cottingham, is this map, this basic map, substantially the same map which was introduced yesterday when Mr. Buck was testifying, being Mr. Hudnall's map of the sand thickness of the Woodbine section in the East Texas field?

A. I think it is the yellow portion reflects substantially the area covered by the eighty foot isoback line. That is the line of equal thickness of Woodbine. I think that is correct.

Q. Do you know whether these were transposed? Is this a potential map or basic map or sand thickness map?

A. What is that?

Q. Is this basically a potential map or—

A. The map itself is a potential map, the same as Exhibit 38.

Q. I see. Then what does this green line indicate that has been drawn around certain areas on that map?

A. The green line?

Q. I am now speaking of Exhibit 39.

A. The green line on Exhibit 39 represents the 860 foot—not foot, barrels contour of the potential map.

Q. Now, what significance does the 860 barrel contour have?

A. To the eight hundred isoback line?

Q. No, I mean all wells within this 860 barrel contour line, do they have more or less allowable than twenty barrels per day?

A. All wells without—to the north and south and east and west beyond the limits of those enclosures as reflected by the green line gets twenty barrels or less. They get twenty barrels if they can make it and less if they can't.

385

Mr. Tilley:

Outside the green line?

The Witness:

All wells within the green line contours participate in a potential factor. They get twenty barrels or more.

Q. Could you point out to the Court the location of the Rowan & Nichols lease on this map?

A. Right there.

Q. It is within that higher allowable area, is it not?

A. Yes, it is within the high allowable. It is near the east. It is about two-thirds—it is beyond the halfway limit toward the east of the potential, 860 foot potential contour.

Q. Then the yellow area enclosed within the red lines, what area is that?

A. That represents the area in which the sand thickness, according to Mr. Hudnall's map, is eighty feet or more in thickness, I mean the Woodbine. It doesn't necessarily mean the effective part, but it means the Woodbine section from top of the Woodbine to the lower part of the Woodbine. It is eighty feet or more in thickness.

Q. Mr. Cottingham, would you state then from that map whether or not the higher potentials are found generally in the same part of the field as the higher rate of sand thickness area?

A. Generally the higher potentials are where you find the greatest thickness of sand. However, the thickness of sand is only one of the factors of four which enters into the capacity of a well to produce.

Q. Then where these areas do not coincide
386 what would your explanation be of the fact that they are different?

A. In the north end of the field the conditions of permeability, porosity, sand thickness are about the same and the potentials of the wells are about the same. In the south end of the field when you have four variables, permeability, porosity, sand thickness and pressure, as those factors change the potential of the well changes and they

have changed on the south end for obvious reasons. One is because of the difference in the permeability of the sand.

The Court:

Do you think the field is of such a character that it can all be subject to uniform regulation?

The Witness:

I think so.

The Court:

Despite these variations?

The Witness:

I think it should be.

Q. Along that line, Mr. Cottingham, does the potential method of allocation take into consideration the actual combination, in the way it is worked out in the field, of those various factors?

A. I think the potential is the thing that reflects permeability, porosity, sand thickness and pressure more than any other factor. That is all—and possibly position on structure or its proximity to water.

Q. Now, Mr. Cottingham, if you tried a
387 formula that was based on sand thickness alone or on pressure alone or on permeability or porosity alone or any of those factors, times acreage, or if you considered any one of those factors would you get as fair a picture of the productive capacity of the wells as you get by using the potential method of allocation?

A. In as much as I have not calculated those others, but have a general picture, and in as much as the variation of all those factors seems to be within ranges from a low to a high as much as potential, it would occur that potential reflects just about as uniform a condition as any con-

dition—as any factor, any set of factors you could use, because it takes into consideration all of them.

Q. Mr. Cottingham, have you prepared a tabulation of the density of drilling of wells in the East Texas field?

A. I have.

Q. Do you have that there?

A. I have it, and I had prepared a chart that showed the relationship of the various break-downs in sizes of half acres, half acre densities according to wells, but in this scuffle I find that I do not find—here it is.

Q. Will you please come look at this and see if this is what you have in mind?

A. May I find my data from which that chart was constructed?

The Court:

Counsel, can't matters of that kind be put in evidence without the necessity of going into all the minutia with regard to them? The extent of the field has been

388 stated here in the record, the number of wells

have been stated, the exceptions to Rule 37 have been stated and a very fair picture of the amount of drilling over there. If you take that study up you can devote a long time to it, and I don't think it will get us very far. Isn't it better just to state the ultimate fact and let it go at that? He can talk a half hour and after we get through with it we wouldn't be any further along.

Mr. Hart:

All right, sir.

Q. Mr. Cottingham, then just summarize what information you have there. Do you find that most of the wells in the East Texas area are drilled on a smaller area than five acres or on a larger area than five acres?

A. I haven't that tabulation. Have you got it there? I would have to refer to my chart to determine that be-

cause I haven't the cumulative before me. I say, Mr. Hart, I haven't the cumulative before me. I would have to refer to my chart.

Q. Isn't that the cumulative there?

A. No, the cumulative hasn't been given me.

Q. Is it on that one?

A. Yes, sir, it is on this one.

Q. Let me revise my question, please. It having been shown that Rowan & Nichols, with their sixth well, or permit for a sixth well, have a density of one well to 4.16 acres, I will ask you what percentage of the field is drilled up to that density and what percentage of the field is drilled up to a lesser density than that?

389 Mr. Tilley:

We object to that, Your Honor, unless it is based upon a hypothetical question, because the evidence shows that permit never has been granted us because the Railroad Commission granted the motion for rehearing.

The Court:

You don't dispute you have five wells?

Mr. Tilley:

That is right.

The Court:

And you have another in a period of incubation?

Mr. Tilley:

Yes, sir.

The Court:

Let's not speculate with anything like that.

Q. Take it at 4.16 and then at five acres, if you could give the number of wells rather than percentages.

A. The cumulative number of wells, there are—I don't have it in just that break-down.

Q. Well, give it to us as best you can.

A. I have it in four and a half, the density bracket from four to four and a half acres.

Q. All right, how many wells—

A. At four acres there are 9,338 wells. That is on a density of four acres or less.

Q. Then that would make—

A. There is 11,465 wells, which is on a density of four and a half acres or less; and that falls between those brackets. They might be interpolated from that chart.

Q. Now, if there are nine thousand some odd, 390 the number you read, that are drilled to that density or a greater density, then how many are drilled to a less density?

A. Those figures that I read were less density or greater?

Q. Greater density or less acreage.

A. There are 9,338 wells that are drilled to a less density than—

Q. I think we are getting mixed up here. That are drilled on smaller tracts than four acres?

A. That is right.

Q. That would be more densely drilled?

A. That is right, I am corrected; I stand corrected.

Q. All right, then the remainder of the 25,900 wells are drilled on larger tracts?

A. That is correct.

Cross Examination.

Questions by Mr. Tilley:

Q. Mr. Cottingham, what is the present spacing under Rule 37 in the East Texas field?

A. What is the present?

Q. What is the present spacing? The equivalent of one well to ten acres, isn't it?

Mr. Pollard:

We object to that as a legal conclusion unless he means the density to which the field has been drilled.

391 The Court:

Rule 37 would speak for itself, of course, but I suppose there is no objection to his stating it.

Q. What is it, Mr. Cottingham?

A. The spacing rule in the East Texas field?

Q. Yes.

A. Twenty-one barrels to one acre.

Q. Now, will one well reasonably drain ten acres in the East Texas field?

A. In certain areas I think one well will drain more than ten acres and in certain areas I think one well will not drain ten acres.

Q. All right, generally throughout the field what would your opinion be?

A. Throughout the field?

Q. Yes.

A. If you owned all of the acreage in the East Texas field?

Q. No, just give me a general idea of how much of the East Texas field one well to ten acres would not reasonably drain.

A. I think in the area of Rowan & Nichols one well will drain considerably more than ten acres. In the south end of the field I think it will drain a great deal less than ten acres.

Q. Mr. Cottingham, we will save a lot of time, I think we can get through with you in about fifteen minutes, if you will just answer my questions.

A. All right.

Q. Tell me what percentage, generally, of the East Texas field do you think cannot reasonably be
392 drained by one well to ten acres and what number of acres, approximately, if you know.

Mr. Hart:

If the Court please, I wish to object to that question as being irrelevant and immaterial for the reason I think we have to consider the field as it now is drilled rather than on the hypothetical situation which Mr. Tilley is supposing.

The Court:

What is the materiality of the question?

Mr. Tilley:

I am trying to show by cross examination that one well will reasonably drain a certain area. They say the more wells the more oil. I am trying to show that one well will reasonably drain a certain area.

Mr. Pollard:

Your Honor, the position there is they are then in effect collaterally attacking a rule of the Commission and its findings therewith, where they have made no direct attack on it in this suit at all.

Mr. Tilley:

We admit it.

Mr. Pollard:

And the Supreme Court has already held that the exceptions to the rule providing for exceptions to less distances to prevent confiscation and prevent waste are equally a part of the rule as the so-called ten acre spacing which says the man can drill at those distances without permission from any one.

The Court:

Overrule the objection.

393 A. What is the question?

Q. I say what percentage or what approximate number of acres in the East Texas field are there that you say one well to ten acres will not reasonably drain?

A. I haven't made an analysis of that portion of the field which I feel that one acre—more than ten acres would drain, and I have not made an analysis of that portion of the field that I feel that ten acres will not be an adequate drainage area. From a practical standpoint, now, in order that we are talking about the same thing, what do you mean adequately drained?

Q. I mean reasonably drained. You have answered that question before on the witness stand. Can you testify now?

A. What do you mean reasonably drained?

Q. That is to get that amount of oil from under a tract that a reasonably prudent operator would expect to get from under that tract. If you can't answer the question I will withdraw it, Mr. Cottingham.

A. I wish you would withdraw it.

Q. Now, give me the factors again and the percentage of accuracy, as near as you can, that the potential will show in the East Texas field under the way you take those now.

A. The potential in my opinion reflects first the ability of the well to produce, and in that ability of the well to produce it takes into consideration four or possibly five factors.

394 Q. All right, tell me those factors, with the percentage of accuracy, as near as you can.

A. You can't do that.

Q. You can't do that?

A. You can't do it because you have four or possibly five variables.

Q. All right, you will take pressure, it manifests or reflects pressure?

A. Yes.

Q. You can determine that also by bottom hole pressure tests, can't you?

A. That is pressure?

Q. I say you can take bottom hole pressure tests and determine the same thing with more accuracy?

A. That is pressure. You can determine that within a pound or two.

Q. Mr. Cottingham, I say you can take bottom hole pressure tests and determine with a greater degree of accuracy the bottom hole pressure or pressure of a well than the potential will reflect it the way you take it over there?

A. No, potential, that is the proof of the pudding. We might make an error of two pounds in a reading of bottom hole pressure, but potential doesn't make that error.

Q. All right, I will ask you this question, Mr. Cottingham, you take the potential of the Wood well which has a penetration into the sand of two feet. You take the same kind of potential of the Rowan well next to it which has a penetration of sixty feet. Which would show the greatest potential?

395 A. The Rowan.

Q. The greatest potential?

A. Yes.

Q. Then potential doesn't take into consideration the penetration of the sand, does it?

A. What?

Q. The potential of a well doesn't take into consideration the penetration of the sand?

A. But may—

Q. Just answer my question, if you can.

A. Sand thickness is one of the factors in potential.

Q. Mr. Cottingham, I didn't ask you that.

A. All right, I beg your pardon.

Q. I don't want to argue with you, I just want you to tell me.

A. I want to answer you correctly.

Q. Now, if you take those two tests they would be entirely different from a potential standpoint from the number of barrels you would recover, if one well penetrated the sand two feet and the other forty or fifty?

A. They would be different.

Q. That is right.

A. May I make this observation? If you will drill the Wood well as deep as you did the Rowan well, and being in that particular area, and if the other factors were equal, all the factors were equal, then the potential of the Wood well would be the same as the Rowan.

396 Q. That is right, and show the same permeability and same porosity and such factors as that, would they not?

A. There are four factors there.

Q. Let me ask you this question: Would the Wood potential give you any indication of the amount of oil underneath that lease?

A. If it was taken at its present status? We have to go back to how these various potential wells were drilled and how they were equipped before I could answer your question. Under the present condition the Wood well would not because sand thickness is one of the factors that enter into the capacity of the well to produce.

Q. Let's save a little time, Mr. Cottingham—

A. Now these wells here, your company or any other company that took potentials here didn't overlook the fact to take the maximum amount of sand thickness, and they didn't take into consideration—they didn't overlook the fact as to how to put the wells to flow into the tank. they didn't set them on a high hill. The only regulations—

Mr. Tilley:

If the Court please, I want to save a little time.

The Witness:

All right.

Q. Tell me whether or not the Wood well would reflect the amount of recoverable oil under that particular lease if the wells were equipped just the same and penetrated the same number of feet of sand. You can answer that yes or no.

A. I will say yes.

397 Q. You say it will show the result?

A. It will reflect—you first have to have a well and then the size of the well, all of those elements enter into figuring the amount of reserves.

Q. All right, you tell the Court then that that test will show that?

A. The Wood well?

Q. Yes.

A. If you open it up it will be on an order of some eight or ten thousand barrels a day.

Q. Now, tell me if you would take your potential on the Wood well the same way you took Mr. Rowan's potential would that potential of Wood's indicate a different amount of reserves from Rowan or would it indicate—I will state it this way: Would it indicate the recoverable oil under Wood's tract of one-tenth of an acre?

Mr. Hart:

If the Court please—

A. Well, I think so. It is one of the elements, one of the elements.

Mr. Hart:

My objection to that is that the attorney does not state whether he intends to ask what the potential will reflect, the acreage or what he means by recoverable reserves.

The Court:

If the witness thinks the question is ambiguous he can ask him. He seems to be willing to attempt to answer it.

398 Q. Is the question clear?

A. Let me have the question.

Q. If you were to take now a three hour potential under the present plan and under the way you took those potentials shown on that Exhibit 33 or whatever it is, would that potential reflect the amount of oil under Wood's tract?

A. It wouldn't to the degree that those do because those wells were practically drilled through the sand and they reflect all of the four elements and Wood's well scratched it on the surface to keep away possibly from encroachment of water under regulated conditions. And it would not produce as much as the Rowan well even though it was as good a well as the Rowan well is. If it was drilled down to the deep depth of the Rowan well that would be different.

Q. You mean to tell this Court, then, if at this time or at that time when that map was made and those potentials taken that if those wells were equipped exactly alike and if they had the same conditions, the same factors, sand thickness, permeability, porosity, water table, if there was any water under there, would those two wells reflect practically the same potential and would either one of them reflect the amount of oil under each particular lease?

A. It would be one of the factors.

Q. Mr. Cottingham, I believe you stated, or I will ask you to state whether or not the Wood well does have the same potential as the Rowan well on which you
399 took the potential, is that right?

A. In as much as the Rowan well is less than fifty feet from the Rowan property.

Q. Yes.

A. And in as much as we know that the area has uniform condition of sand thickness, permeability, porosity and pressure, if you drilled the wells to the same depth in the sand, I would say that both of the wells would produce approximately the same.

Q. Now, if you were going to allocate allowables to those wells on the basis of the potential and the potential does show the recoverable oil, then you have given no consideration as between Rowan's well on five acres and Mr. Wood's well on one-tenth of an acre or one acre, whatever you call it?

A. If you allocate the production on potentials?

Q. Yes, and potential reflects reserves, then you haven't given any consideration, have you?

A. The potential of the Wood well is extropolated.

Q. What does extropolated mean?

A. I believe—I haven't looked at my dictionary in a long time, but I believe it means to insert between. It means to supply with equal weight.

Q. Anyway, you haven't given it any differential at all in your proration schedule, you have given the Wood and Rowan wells the same?

A. No I haven't. I am assuming now Mr. Wood might not have drilled his well for a potential test well.

Q. All right.

A. Now, if he had drilled his well I am confident that there wouldn't be very many barrels difference from his well and Rowan's well, drilled to the same depth, because as brought out by Mr. Buck, the area is very permeable, very uniform in that particular area and because it is so close we wouldn't expect any material difference between permeability, porosity, pressure and position on structure and all of those elements.

Q. Now, you have compared this map, this sand thickness map which is Exhibit No. 35. Have you compared

that sand contour map with your potential map, which is Exhibit No. 38, to see whether or not they bear any relation to each other?

A. Is this Exhibit No. 38?

Q. Yes, that is your potential map.

A. Yes.

Q. You have. Do they bear any reasonable relationship?

A. This map here reflects the top of the structure and in this particular area, and I don't know what relationship you want me to determine between this map and that, whether it is sand thickness, pressure, potentials or what.

Q. Does your potential, take the Castleberry Survey, which is in the red on Exhibit 35—that is your sand thickness map, is it not?

A. That is not a sand thickness map.

401 Q. What kind of map is this, then?

A. That is a subsurface structural map on top of the Woodbine, it shows the condition of the top of the Woodbine.

Q. Have you had occasion to look at more than one sand contour map since you have been in the Railroad Commission office? Have you had occasion to look at numerous sand contour maps prepared by major companies?

A. Yes, I have one. I have one—you mean the surface—subsurface contour map delineating the top of the Woodbine sand?

Q. That is right.

A. Yes, I have.

Q. Have you examined several of those maps?

A. Yes, sir.

Q. Then the major companies do prepare such maps?

A. Yes, sir.

Q. They do base their estimates of recoverable oil on those maps?

A. No, sir.

Q. What do they draw those maps for?

A. That shows the top—

Q. Answer my question.

A. What do major companies prepare that map for?

Q. Yes.

A. It delineates the structural position of the various wells on top of the Woodbine,

Q. Mr. Cottingham; answer my question, please.

402 Mr. Hart:

We object to the question as being immaterial. It is immaterial what the purpose or motive of major companies may be in preparing maps.

The Court:

I thought the witness was attempting to answer it. He was giving his idea of what the map was for.

The Witness:

The map is for the purpose of showing the top of the Woodbine.

The Court:

Then he will want to know next why do they want to know that.

The Witness:

That is material if they want to calculate the number of feet to the water level, for one thing.

The Court:

Then in the last analysis it has some relation to sand thickness, doesn't it?

The Witness:

That is correct, if they want to use it for that purpose.

Q. All right, then, they do use that for that purpose?

A. Yes, sir.

Q. Now, do those maps show the water table on the west?

A. Which map?

Q. Sand contour maps of major companies?

A. No.

Q. But they do show the sand thickness in the East Texas field?

A. Are you talking about structural maps or isoback?

Q. I don't know. I will ask you which one have you looked at?

A. This is a map that just delineates how the surface of the Woodbine looks if you could rip off all of the sediments down to the Woodbine and toss it away.

Q. Now, what do the maps of the major companies now show in reference to contour lines reflecting the sand thickness from the east through the Fairway over to the west side?

A. Well, they might show that by cross section maps, as Mr. Buck and I have shown here.

Q. They might show that. Don't you know what they have shown?

A. Well, of course they could show that. I don't know what major companies or anybody else shows. But if you take a cross section from the top of the Woodbine to the base of the Woodbine and if you would take it at right angles to the longitudinal center of the business it would be cross section.

Q. Now, Mr. Cottingham, you have examined Mr. Hudnall's map, haven't you, showing the contour lines there, how the sand thickness varies from the east side on over to the west side, have you not? You have seen that map he prepared; have you not?

A. Yes.

Q. You have seen Mr. Buck's map over here, have you, not?

A. Yes, sir.

Q. Now, have you looked at Mr. Buck's map?

A. I have taken a casual glance at it. I haven't had the opportunity to study it.

Q. Have you ever made any endeavor to prepare a sand thickness map for the Railroad Commission yourself since you have been there?

A. I have not.

404 Q. Have they ever directed you to do that?

A. I have not.

Q. Then if you could prepare a sand contour map showing the sand thickness, if it were possible to do that, you have not made any effort to go out and get Schlumberger tests or logs or such other information as might indicate that, have you?

A. Schlumberger log is a private project. The Railroad Commission of Texas can't go and inquire into personal, private business like that. All they require is a driller's log.

Q. Mr. Cottingham, don't you know that the Railroad Commission statutes, the statutes of the State of Texas give you a right and you have exercised that right to go into the company's office and examine their records? Is that right or not?

A. It is not right.

Q. It is not right?

A. In other words, there are various types of exploratory work, and that is not contemplated, as I understand it as an engineer, knowing nothing about law.

Q. Have you made—

A. Let me answer.

Q. All right.

405 A. That the Commission can't require them to give. They do require a driller's log of every well completed in Texas.

Q. Does that indicate—

A. But they can't require the Schlumberger log. They require Halliburton, who has a similar service, to give us these logs. We don't have this stuff available to us.

The Court:

Gentlemen, you are getting into a lot of arguments about immaterial matters. You ask him a question and he takes the question to pieces and then you argue out each piece of it. You have lost sight of where you are going. What is your point? What is it you want to find out, whether they have taken into consideration sand thickness or if they know what the sand thickness is themselves?

Mr. Tilley:

Yes.

The Court:

You are on cross examination. Why don't you ask him the question direct?

Mr. Tilley:

He won't answer it direct.

The Witness:

Try.

Q. Mr. Cottingham, have you tried to get Schlumberger tests from the major oil companies or from the Schlumberger people so as to permit you to draw a map showing sand conditions over there? Answer the question yes or no.

A. I have not.

Q. You have not?

A. Let me qualify it. If you will permit me, let me qualify that statement. So far as I know the statute doesn't require us to—

406 The Court:

I don't care about that. That is your opinion as to the law. I understood you to testify before lunch you had three or four hundred Schlumberger logs.

The Witness:

We have acquired them since this case.

Q. Mr. Cottingham, you have about 25,000 logs in your possession, do you not, which show sand conditions throughout the field?

A. There are a few of them—

Q. Answer the question.

A. That is correct. We should have a log from every well that is drilled.

Q. But you drew this map from seventy-one wells, did you not?

A. No.

Q. All right, how many potentials did you take over there?

A. We took seventy-one interior potentials and then for locating the zero line between. I should say—I have forgotten how many. I counted them at one time. But between 250 and 300 outlining the zero line between dry holes and productive areas.

Q. All right. Now, let's just start from the north end of the field and go to the south. You say the sand conditions are fairly uniform throughout the north end?

A. I think it is uniform so far as the Gladewater Nose is concerned; on the north end of the structure and around the periphery of the structure so far as we know it to go it is very irregular.

Q. All right. Now, what about the south end?

407 A. It is—what do you mean?

Q. What about sand conditions there?

A. It is very erratic, as reflected in the pressures.

Q. It is very erratic?

A. Yes, sir.

Q. All right. Then you state that the potential does show sand conditions, do you not?

A. It reflects a combination of four factors.

Q. It reflects now what with reference to sand, the permeability, porosity and what else?

A. The thickness and pressure.

Q. All right.

A. And possibly position on structure, proximity to water.

Q. Now, you say that bottom hole pressure does reflect the thickness of the sand?

A. Bottom hole pressure?

Q. I mean potential reflects thickness of the sand?

A. That is one of the elements, one of the factors in potential.

Q. Does it reflect sand thickness within a reasonable degree?

A. That is right.

Q. All right I will give you a sand thickness of—well, I will give you a potential of 400 barrels, a well that will make 400 barrels. Now you tell me where you—you tell me how thick that sand would be.

A. You can't do it.

Q. All right.

408 A. Because you have four factors. You don't know the relationship of those factors.

Q. Then it doesn't show sand thickness, does it?

A. Yes, it shows sand thickness if you have—if you have the same pressure and if you have the same porosity and twice the same thickness you have approximately twice the potential.

Q. Mr. Cottingham, you are not answering my questions, you are not answering my questions. You are telling me that potential reflects a certain thing and then when I ask you how it reflects it then you tell me about

a bunch of other factors. That is not what I want to know. I want you to tell me how you can go to this map when I tell you a well has a potential of 400 barrels an hour, I want you to tell me how you could go to that map and tell me how thick the sand would be around that well.

A. I can't do it.

Q. You can't do it?

A. No.

Q. All right. Now—

A. Because I have three other variables in there.

Q. You tell me also that your potential will reflect the water table, is that right?

A. We—yes, possibly.

Q. That is right.

A. I said possibly. I am not sure on that point.

409 The Court:

What is the ultimate thing you are trying to get at, counsel? Do you want to know whether the potentials of the wells will indicate the reserves?

Mr. Tilley:

Your Honor, I want to show that the potential does not reflect that, and it would—

The Court:

Why don't you ask him would the fact you have a well on a piece of land which produces 500 barrels an hour or 900 barrels an hour, would that indicate how much oil you have in the reserve there or do you have to determine the reserve by other ways? I know you can't get it absolutely, but people buy on engineers' figures and lend money and generally deal on that basis.

Mr. Tilley:

Your Honor, I asked him—

The Court:

I don't want to get in an argument with you, too. I want to get this thing along because after all I want to get something out of it.

Q. Now, Mr. Cottingham, if you were employed to estimate the recoverable oil under a particular tract in the East Texas field would you determine the value of the recoverable oil of that tract by the potential factor alone?

A. No.

Q. You would not?

A. No, sir.

Q. All right, how would you go about determining the recoverable oil?

A. Under a particular tract?

Q. Yes.

A. I would first determine whether it had a well on it.

410

Q. That is right.

A. Then I would see how big the well was, knowing that a well's potential takes into consideration the factors of permeability, porosity, sand thickness and pressure.

Q. Let me correct the question. Let me change the question. If you were going to estimate the recoverable oil under a tract in the East Texas field and you had this potential map before you could you estimate within any reasonable degree of accuracy the recoverable oil under that tract?

A. I would take the potential map as one of the factors.

Q. That is not my question, Mr. Cottingham.

A. Let me see. I beg your pardon if I misunderstood your question.

Q. I asked you could you take this potential map in front of you, looking at these potential contours, these potential contour lines alone, and tell within a reasonable degree of accuracy the recoverable oil under that tract?

A. No, sir.

Q. You could not?

A. The answer is no.

Q. All right; we are getting somewhere. Now, Mr. Cottingham, let's suppose this is the east side, I am pointing up above the map. This is the east side on Exhibit 38. Suppose all of this area, about one-third of the field across was drilled to a density of one well to one acre and all of the east side was drilled to a density of one well to one acre—

411

A. The west side you mean?

Q. Yes.

A. All right.

Q. But the Fairway was drilled one well to ten acres. Would the Fairway or those owners of leases in the Fairway get, under your present plan of proration, the amount of oil which at this time underlays those leases?

A. Let's see, this is the west side, which is drilled to a density of what?

Q. Everything is drilled to a density of one well to one acre except the Fairway.

A. It is drilled to what density?

Q. One well to ten acres. Would the leases or the operators of those leases get, under your present plan of proration, the allowable—the reserves under those tracts, the recoverable reserves?

A. I think not.

Q. You think not?

A. (No answer.)

Q. Doesn't that show, Mr. Cottingham, that it doesn't matter how many wells you have in the East Texas field or what your average density is, if you have one well to ten acres, the measure of whether or not any operator in that field will recover ultimately the oil under his land depends solely on the amount of his daily allowable?

A. The amount that he recovers will always depend on the amount he takes out.

412 Q. All right; then the fact that the field may be drilled to a density of one well to five acres or one well to six acres doesn't mean anything in so far as the amount of recoverable oil that any operator may get, unless the particular operator is permitted to produce or permitted to drill enough wells that he will ultimately get the oil under his tract?

A. I think it is obvious that if you have more wells and more allowable you will get more withdrawals from that particular tract.

Q. All right. Now, Mr. Cottingham, let's say that we have three containers. Two of those containers have a gallon of water and one has five gallons of water. And we will place them in a line east and west.

A. Let's see, I didn't get the size of those containers.

Q. Each one is one gallon except the middle and it is five gallons. Now, the two one gallon containers on the east and west of that five gallon container, if you put—and those containers are disconnected—if you put one tube in each of those three containers and you withdraw ratably and equally from each container it will take five times longer to get the water out of the five gallon container than it will to get it out of the one, will it not?

A. According to mathematics you are correct.

Q. All right, let's say that the East Texas acreage around Mr. Rowan's area, around the Gladewater area—

A. Here it is up here, Mr. Tilley.

413 Q. Well, this area, this Gladewater area.

A. Here it is.

Q. Let's say that the east side and the west side both have an ultimate recovery of 10,000 barrels to the acre and the Fairway has 100,000 barrels to the acre.

A. That is just a theoretical assumption?

Q. Yes. Now, if you produce the wells on those three sections equally at twenty barrels a day or comparatively twenty barrels a day, I want you to tell me how the time element will take care of Mr. Rowan and his company so

he will ultimately get the amount of oil under his tract?

A. According to the conditions obtaining in the East Texas field at the present time?

Q. Yes.

A. According to its present plan?

Q. That is right.

A. For the last six years, I believe it is six, six or seven years that Mr. Rowan has been producing on his tract he has produced approximately 358,000 barrels of oil, or 14,332 barrels per acre. I am showing where the time element will come in.

Q. That is all right.

A. He has taken out more than a third of his oil according to his first estimate and a considerable portion according to his second estimate and a considerable portion of what his engineer says he had originally under his land. Now, he has today as much oil as he had
414 originally, less, according to the estimates, between six and eight thousand barrels, so he hasn't been hurt yet by drainage. In fact, he has drained to him 350,000 barrels. Now, the question is how is he going to fare from now on out?

Q. That is right.

A. As previously pointed out, in my opinion the highest portion of the area is in the south end. It is some forty feet higher than it is up here, but because of the variable condition of the reservoir rock, impermeable nature of the rock, the water force can't transmit itself, its pressure, across this much distance across the south end. Therefore, this area in here is practically operated on a gas drive proposition and there wasn't very much gas in the oil in the reservoir in the first place. In other words, it was saturated only at 750 pounds per square inch, whereas the pressure was 1,625 pounds per square inch. So this area here is going out of the picture first, as evinced by the area now has a gas cap in it. The upper portion of the roof of the structure is filled with gas. The

gas has come out of solution. The wells are on the pump, and your greatest number of wells that won't make the allowable are in this portion of the area here where it is the highest. It is my opinion that this highest area here, because of the impermeable condition of the structure, will go out of the picture first. Now, as we come on up through the red contours we are coming to an area on the

415 Gladewater Nose which is very permeable, and it is a nose, it is in that condition, that is, it is a hump. Now, this area here in which the Rowan & Nichols well is located will receive drainage, as it has heretofore in the amount of 350,000 barrels. It will receive drainage from the northwest it will receive drainage from the southwest. In other words, it is a focal point, there will be a radial drainage into a small portion of the Woodbine section, as evinced more particularly by this line here. Those are lines of equal distance, equal distance above sea level, and of course the water level will rise somewhat regularly, even though you have variations, high variations locally. So when the water encroaches and all of this portion is flooded, this portion is flooded and this portion is flooded to the southwest, this area in my judgment will be the last area in the East Texas field to produce. He will, as he has done in the previous, receive oil from the northwest. He will receive oil from the west. He will receive oil from the southwest, and his position possibly five years from now will not be materially different from what it is today with the amount of his recoverable reserves under his tract.

Q. All right. Now, Mr. Cottingham, you are basing the present order not on how much oil was underneath a tract five or six years ago, but on the amount of recoverable oil at the present time, are you not?

A. Let's take it that way.

416 Q. You don't take into consideration the hot oil run around the East Texas field?

A. That is right.

Q. Now, you talked about Mr. Rowan estimating some time ago that he had more oil than he estimates now?

A. Yes, sir.

Q. Of course you know, do you not, Mr. Cottingham, that the best engineers in Texas underestimated the recoverable of the East Texas field?

A. That is just it.

Q. That is just it. Now, let me ask you this: do you not know further that at the time those estimates were made that the allowable at that time was approximately a million barrels a day?

A. Yes.

Q. Did you not make the same estimate?

A. No.

Q. Would you today make any estimate as to reduction and ultimate recovery if the allowable was a million barrels a day?

A. I am telling you I feel—

Q. Answer my question.

A. What is that?

Q. Can you answer my question? If the allowable was a million barrels today a day would the ultimate recovery of the field be reduced substantially?

A. I would think that the recoverable oil of the
417 East Texas field at a million barrels a day would be reduced on the order of somewhere near a half and a billion barrels if it was raised to a million barrels a day.

Q. Mr. Cottingham, you heard the figures and testimony given by Mr. Rowan to the effect that although the rest of the field has recovered so far to date thirty-seven per cent of the estimated recoverable oil his lease has only recovered twenty-seven per cent. So Mr. Rowan, if that testimony is true, has not recovered any more than his fair share of the oil, has he?

A. Possibly not as much, possibly not as much, but in time he will recover possibly more.

Q. That is what we are getting to. All right, here the Rowan lease is in the Fairway. Mr. Cottingham, it doesn't make any difference, does it, how much oil is underneath a lease until the operator is permitted to recover it, that is academic, isn't it?

A. I don't know whether it is academic or not.

Q. In other words, if you say a man has 50,000 barrels per acre recovery, it is just merely fiction if the allowable is not such he can recover that, is that not right?

A. Well, you know—

Q. You can answer that question yes or no.

A. I would rather not answer it just yes. I will say yes with some provision.

Q. Now, Mr. Cottingham, let's come back to 418 the Rowan lease, the allowable. He is on the top of the structure, is he not?

A. That is right, he is on the Gladewater Nose, near the top.

Q. Near the top of the structure?

A. Yes.

Q. Now, you are going to give consideration to position on the structure, are you not? You said you were going to give consideration to position on the structure. You said you thought that was a factor to be considered?

A. You asked me about this potential and I said it might reflect position on the structure. I haven't come to that yet.

Q. I will ask you whether or not in allocating allowable among operators you would give consideration to position?

A. To the operators generally or Mr. Rowan?

Q. To operators generally and to Mr. Rowan too?

A. The present method of allocation takes into consideration position on structure.

Q. You give consideration to sand thickness. He has practically the thickest sand in the field, does he not?

A. It is near the thickest.

Q. And you say the sand condition playing across the field there is generally uniform and very permeable and with good porosity?

A. The most uniform condition in the entire field is in this area.

Q. All right, then how does the waterdrive move in reference to the approach of the same to his lease and which direction will it move the oil unless it is extracted?

A. Here is water, if it encroaches somewhat uniformly. It might be up and down and up and down and up and down.

Q. Give the directions for the Court reporter.

A. But his high—

Q. Give the directions.

A. His highest position, this defines the contour lines between 3,220 and 3,200—

Q. You misunderstood my question, Mr. Cottingham. I just want you to point out on Exhibit 35 here which way the water is moving and approaching which way. Is the water moving here?

A. It is going to gradually move in an irregular eastward position, but it can't ignore the structural position of the Gladewater Nose.

Q. All right. Now, is the water table going to rise evenly or is it going to go in contours or is it going to go—how is it going to go?

A. I refer to this exhibit in answer to your question. I will refer to this exhibit here, Exhibit No. 34.

(At this point a recess was taken, at the conclusion of which the following proceedings were had:)

Q. Now, Mr. Cottingham, let's resume over here, and I think I can get through with you in just a minute. Did you state just exactly how the water was going to approach over here, whether it was going to be level or just how it was going to be, or is it going to be as you have indicated on Exhibit 34?

A. In this particular area?

Q. The Rowan area.

A. In the Gladewater Nose, if you would permit me to state, that is evinced by this structural contour here. It appears from all the evidence that we have that the conditions of permeability and porosity are more uniform there than any other place in the Woodbine structure of the East Texas field, much more so than it is in the south end.

Q. Yes.

A. Now, if the conditions of permeability are uniform and the porosity is uniform and the withdrawals are uniform then the water level will have a tendency to rise, but we have this condition—

Q. That answers my question.

A. I haven't answered your question.

Q. Just answer, don't tell me why, just tell me whether it does rise on a level or whether or not it is kind of a sawtooth shape like you have on Exhibit 34?

A. I think the water table will be sawtoothed like that.

Q. Like that?

A. Yes, sir, that is right because you don't have any ideal conditions in reservoir rock.

Q. All right, if the area east of Mr. Rowan is very densely drilled and the area around Mr. Rowan's
421 lease is not very densely drilled, then the oil will migrate, of course, to the east. Is that right?

A. Now, let's see.

Q. All right, just say this area all through the east here.

A. Through this part?

Q. The east part of the Castleberry, east of the Castleberry, and the area in the Castleberry is not densely drilled, under your present plan of proration the oil will migrate to the east side, is that right?

A. I am afraid I don't understand your question. Do you mean to take a hypothetical case?

Q. A hypothetical case.

A. All right.

Q. There are very heavy withdrawals from the east due to density. Naturally this oil from the Castleberry will migrate to the east side, won't it?

A. If the density east of Mr. Rowan is a great deal more dense than his and the withdrawals correspondingly are more then they will be—he will gain less oil by repressuring.

Q. Because it will migrate to the east?

A. That is right, it will be captured over there before he has a chance to recover it.

Q. Now, Mr. Cottingham, you state that Mr. Rowan has as much oil under his lease as he had in the beginning?

A. No.

422 Q. What did you state?

A. I stated he had as much oil under his land today, less on the various estimates given by Mr. Rowan, of from six to eight thousand barrels.

Q. All right, then east of Mr. Rowan's well, at least to the extreme feather edge of the field, does all of that area have practically and ratably the same amount of oil that it had originally?

A. If it is above 755 pounds absolute it is practically the same. They have acquired under their land by drainage the same as Mr. Rowan has.

Q. Then, Mr. Cottingham, if Mr. Rowan is not permitted to withdraw the amount of oil that he has under his lease that is recoverable then that oil will migrate to the east, will it not, if the movement is towards the east? Can you answer that yes or no?

A. I can't answer that yes or no.

Q. You can't answer that yes or no?

A. No.

Q. All right, can you answer this yes, or no: if only a certain—I will ask you this question: as the allowable is reduced, of course the allocation to the wells will be reduced, will it not, accordingly?

A. That is right.

Q. Is the allowable going to decline, going to be on a constant curve from now on out due to recoverable oil and waste conditions and drop in bottom hole pressure?

A. I don't believe I got your question.

423 The Court:

I don't see how he can answer that question.

Mr. Tilley:

I beg your pardon?

The Court:

How can he answer that question?

Mr. Tilley:

Because he has stated that the bottom hole pressure constantly declined.

The Court:

You asked him what the allowable was going to be in the future?

Mr. Tilley:

Yes, sir.

The Court:

Can he control that?

Q. If the Railroad Commission continues to respect the waste statutes and they are the same as they are now, will the allowable come down on a constant curve?

A. In other words, if the Railroad Commission, you mean, maintains a top allowable of the field in the interest of conservation?

Q. Yes.

A. And that there are more wells drilled in the intervening time will the allowable remain the same, is that your question?

Q. No. You based the allowable for the field not by the number of wells, do you not, but by whether or not a certain amount of oil withdrawn daily will cause unnecessary waste?

A. That has been the practice because the field has a critical rate of production which the Commission feels beyond which will create physical waste.

424 Q. Mr. Cottingham, the bottom hole pressure is constantly declining, is it not?

A. It has declined throughout the years.

Q. And the oil constantly withdrawn, leaving less oil?

A. That is correct.

Q. And I only ask you that question to determine whether or not the allowable is likely to decline?

A. For which lease?

Q. The whole field, the daily allowable.

A. This is from month to month?

Q. Yes, from year to year, say from year to year?

A. I don't believe you can project it from year to year. I believe you can project it from month to month because we take bottom hole pressure surveys and if it nose-dives we bring it back. But back to your question, if the new wells gradually declined, the amount of wells that can't make the allowable and the wells that are going dead and being plugged and abandoned is increasing there will come a time when the new well allowable will be less than that which is increased by reason of wells going out of the picture and those that can't make the marginal allowance.

Q. For the last three or four years has there been a general decline in daily allowable for the East Texas field over the year, an average per year?

A. Per year?

Q. Yes.

A. That is right.

425

Q. All right.

A. All over the State.

Q. Now, at the present time the market demand is less than the amount of oil that you can produce throughout the State of Texas without causing unnecessary waste, isn't that right?

A. This field could produce the entire market for Texas at the present time, but it would create physical waste.

Q. Is there enough oil that could be produced daily in Texas now in excess of what the actual market demand is? In other words, you are producing now the amount of oil daily which is equivalent to the market demand, are you not?

A. We could produce more oil today without creating physical waste than we are producing.

Q. That is my point. Now, you state that—

A. I say physical waste, within reasonable limits.

Q. That is right. Let's take this map we had a moment ago, the potential map, or we can use this potential here. You state that potential as taken by the Railroad Commission reflects permeability, porosity and sand thickness and those factors?

A. Pressure.

Q. Pressure.

A. And possibly position on structure.

Q. All right, would a potential therefore reflect a condition in the sand such as shale lenses and things of that kind?

426 A. Yes, sir.

Q. Would it take into consideration permeability and porosity as you say?

A. Sure, that is one of the factors, two of them.

Q. Now, are the shale conditions in the south part of the field fairly uniform throughout the south part?

A. No, sir.

Q. They are not?

A. No, sir.

Q. They vary?

A. As evinced by this map here. The greatest thickness is in here; the greatest potentials are in here.

Q. All right, I will ask you this question, Mr. Cottingham: you have potentials here varying from 700, 900 on down to 100 and practically nothing on the east?

A. To dry holes.

Q. Yes. Now, will you show me the shale conditions throughout the field as reflected by your potential map? Will you show me the variations in shale, where the shale is in the sand and whether permeability and porosity varies, according to your potential map?

A. The potential map reflects four factors. One of them—

Q. That is not what I asked you.

A. I am coming to your question. One of them is sand thickness, and if you have an impervious portion of the section that is not contributing to oil flowing into that hole that reduces the sand, the effective sand thickness.

Q. Mr. Cottingham—

427

A. And that is reflected in the potential.

Q. Let's take this map here. Now, Mr. Cottingham, step right over here, will you, please?

A. Yes, sir.

Q. Here are your contour lines on the east in the East Texas field. Down in the south end you say that there is a lack of uniformity in the south end of the field in sand conditions, permeability and porosity and there is lots of shale and it is uneven?

A. Yes, sir.

Q. I want you to tell me just exactly where that is shown in your potential map.

A. It is reflected in the size of the potentials. Where you have the greatest sand thickness, as shown here, as along this line, the greatest potentials as along this line.

Now, you are dealing with four factors and possibly five, and as those factors change your potentials change. You might have a great deal thicker sand and it might be very tight and you will have a very small potential.

Q. Mr. Cottingham, you are not answering my question.

A. I beg your pardon.

Q. What does bottom hole pressure reflect besides pressure, if anything?

A. Pressure, permeability, porosity and sand thickness.

Q. Then you could substitute that for potential if you wanted to?

A. No, you have to take four factors.

Q. What does it reflect, permeability, porosity
428 and sand thickness?

Mr. Mahon:

I don't think the question is plain.

Q. All right, what does bottom hole pressure reflect?

A. Bottom hole pressure reflects the amount—you run a gauge in the well—

Q. A bomb they call it?

A. A bomb, and it reflects how much pressure per square inch is down there at that particular level.

Q. Does it reflect—

A. And it is one of the elements or one of the factors, bottom hole pressure, of potential, it is one of the four main factors.

Q. But what does it show other than pressure?

A. Which, bottom hole pressure?

Q. Bottom hole pressure.

A. It just shows pressure.

Q. It doesn't show permeability, it doesn't show porosity?

A. No.

Q. It doesn't show anything but pressure?

A. That is all it is designed to show.

Q. Now, show the Court, Mr. Cottingham—this is a potential on what well? This is a potential test on well number what?

A. Well, let's pick out one here.

Q. No, let's pick out this one here. Sixty-nine, is it? Well, it is in the south end of the field. Now, how far is it from that well to the extreme east side of the field?

A. Let's see, this is 1,000 feet—2,000 feet—no, 1,000 per inch, is it, now?

Q. Your scale is one inch to 2,000 feet.

A. All right.

Q. Tell me how far that is.

A. From this well?

Q. Yes.

A. This is approximately eight inches, and that would be—

Q. 16,000 feet?

A. 16,000 feet.

Q. Now, in that 16,000 feet I want you to tell me whether that sand is ten feet thick or twenty feet thick or whether it has a degree and percentage of thirteen per cent porosity or just exactly how much shale it has, or tell me anything that you can from that map about sand conditions in that area.

A. I am pretty sure that on the east side of that well that the sand is zero thickness, from available data that we have, and in as much as this well is in the longitudinal—

Q. I want to know from this map what this map shows you.

A. This well don't show how thick the sand is.

Q. It does not?

A. No.

Q. It doesn't show the condition of the sand between that well and the east side?

A. No.

430 Q. Then any consideration you give to these wells is by virtue of potential and not by fact?

A. No, by extropulation, only by extropulation.

Q. What do you mean?

A. We have zero and a good well here and we know by extropulation between those two—that—

Q. You conjecture as to what that is, don't you?

A. It is a problem of extropulation.

Q. That is right, you don't know and you have made no test to tell what the condition in that area is, or any of the rest of the East Texas field from these potentials east or these potentials west, have you?

A. We have asked the operators—

Q. Mr. Cottingham, I am not asking you what you asked the operators, I am asking you from your potential test have you been able to glean any information with reference to shale conditions in the sand and such things as that?

A. No, not from potentials.

Q. Now, you have 25,000 cores in your office or in your Commission, do you not?

A. No.

Q. You have logs of 25,000 wells, have you not?

A. Drillers' logs from six inches in depth to through the entire Woodbine section.

Q. Now, through those cores or those logs could you go and determine the inaccuracies in reference to sand thickness, if you wanted to determine that?

A. No, sir.

Q. You could not?

431 A. No, sir.

Q. Could you take Schlumbergers and determine it?

A. For this reason, in the early history of the field—

Q. I withdraw the question. I say within a reasonable degree?

A. No, we can't.

Q. What is the variation between the sand thickness in the East Texas field? Does it go from one foot to one hundred?

A. That is right. It is a little more than one hundred. Not effective Woodbine, but from zero to 120 feet.

Q. In the Woodbine sand itself?

A. Yes.

Q. Now, in the sand contour map you saw how did they draw those contour lines, every ten feet?

A. I don't recall which map.

Q. You said you had seen a map, a contour map.

A. I will have to ask Mr. Hudnall.

Q. Have you looked at his map?

A. Are you referring to the isoback?

Q. Yes.

A. Ten foot.

Q. Ten foot. Then your chances of mistake in a sand thickness map would be from twelve to one, would it not, because it would go from one foot sand thickness to 120 feet on ten foot contour lines, would it not?

A. I didn't get that question.

Q. If you would draw contour lines for a sand map for every ten feet of sand is what I mean you
432 would have a variation thereof—for mistake—of twelve to one?

A. Why twelve to one?

Q. Well, you have only twelve contours if you got a maximum of 120 feet, is that right, if you drew those contour lines every ten feet for every ten feet of thickness?

A. Assuming that the 120 feet was pure sand it would be twelve to one.

Q. Well, take the Woodbine.

A. If that 120 feet was pure sand you would be correct.

Q. There is very little area in East Texas, in the East Texas field that is more than 100 feet of Woodbine sand, is that not so, the whole Woodbine formation?

A. That is right. This map here delineates, the red line delineates the eighty foot isoback.

Q. All right, that is the eighty foot?

A. Yes, sir.

Q. All right, now in your potential you have a variation from a potential of one barrel an hour to 950 barrels an hour, do you not?

A. Wells that—

Q. Your highest potential is 1,100 something, isn't it?

A. That is correct.

Q. Then you have a variation for mistake of 1,100 to one, do you not?

A. A mistake?

Q. You have a chance of mistake of 1,100 to one?

A. The variation in ability of the wells to produce in the East Texas field might be one barrel per hour to 1,100 barrels per hour.

Q. Now, Mr. Cottingham, let's get back to the map. Let's take Schlumbergers on this area, any part of the area in here, to determine within a reasonable degree the sand thickness and permeability and porosity of a well say where I am pointing my finger; and go 2,000 feet and take another one and draw lines on that, and would they be as fairly accurate as the lines you have drawn?

A. You mean to delineate what?

Q. Just take a well with the Schlumberger test that you have of it, over here halfway between the potential test you have taken on the extreme east side, and protract that line like you have protracted your potential lines, would you not have a greater degree of accuracy in those lines than you have in your potential lines, because you have not only the Schlumberger, but you also have the log record in the Railroad Commission of all of those wells?

A. What does the Schlumberger log reflect?

Q. You testified that it reflected water, permeability, porosity and what not.

A. I didn't testify to that.

Q. Well, I will ask you what you did testify to. I am sorry. What does the Schlumberger reflect?

A. It shows conditions of porosity and it might reflect the saturation points and permeability—not permeability, but saturation—and—I mean porosity and saturation.

434

Q. Then you could—

A. And water.

Q. Then you could take these Schlumberger tests and determine where your water was and the general sand conditions with a reasonable degree of accuracy, could you not?

A. By what token has the Railroad Commission got authority to demand Schlumberger logs?

Q. Have you got a right to demand potential tests?

A. That was an order.

Q. I am not asking you what right you have. Let's assume—

A. We don't have the Schlumberger and never have had it.

Q. Mr. Cottingham, you have an appropriation up there do you not, in the Railroad Commission, to run the Railroad Commission?

A. Yes, sir.

Q. You take bottom hole pressure tests, don't you?

A. Yes.

Q. How do you take those?

A. We send engineers out and they take them under certain orders of the Railroad Commission.

Q. Now, if you have an order of the Railroad Commission and an appropriation to take Schlumbergers then you can take those Schlumbergers and you can draw your potential lines?

A. We might order it, but I don't know whether we could get it.

Q. Is it physically possible?

A. Oh, yes, the Commission can order it, but
435 I don't know whether we could get him to obey
the order.

Q. They can be taken by the major companies, can
they not?

A. Oh, yes, they can be taken by independents.

Q. They are taken throughout the State, aren't they?

A. Yes, but I don't know how many Schlumberger logs
have been taken in this field.

Q. Now, this is argumentative and I withdraw the
question. But I will ask you if those tests are taken what
they would reflect and if they reflect these conditions
which you speak of could you draw contour lines showing
the general sand thickness and permeability and porosity
throughout the East Texas field?

A. Generally the Woodbine sand is composed of a suc-
cession of shale lenses, sand lenses, volcanic ash lenses.
Some of those lenses are very short in distance; some of
them are of considerable magnitude.

Q. Yes.

A. Now, who is going to interpret between 200 foot
distances in this field and throughout the field all of the
elements reflected in the Schlumberger log?

Q. All right.

A. Now, you might be—

Q. Just a minute.

A. Just a minute. Will you permit me?

Q. Yes.

A. You might go ahead and have all the Schlumbergers,
but I am just wondering if that wouldn't just
436 clutter the whole picture up if you had a Schlum-
berger for each well in the field.

Q. Mr. Cottingham, the more Schlumbergers—

A. Because sometimes an offset well will get four or
six feet of impervious material and the next well don't
get it.

Q. All right, when you have a potential, when you got a potential that didn't look right when you were taking these potentials you threw that out, didn't you?

A. We held some in abeyance and they drilled another well and we found out it was correct.

Q. Now, could you throw those same tests out if they were Schlumbergers? You threw the potentials out in order to make your contour lines?

A. No, we didn't throw any potentials out there.

Q. You threw some out in the field?

A. Not here. We held one in abeyance because we didn't think that that particular well could produce that much oil through that, so we held it. He drilled another well and it produced the same amount.

Q. Now, Mr. Cottingham—

A. It was an offset well.

Q. The more information you have about sand conditions down there the more accurate your map will be, is that not true?

A. Yes.

Q. Then if you have Schlumbergers on a reasonable number of wells you can draw a reasonable number of contour lines?

437 A. What is a reasonable number? .

Q. A reasonable number, seventy-one; seventy-one.

A. Does a Schlumberger—

Q. I am asking you questions, Mr. Cottingham.

A. I am saying that a Schlumberger doesn't reflect permeability, porosity, sand thickness always. It almost always reflects sand thickness and—

Q. Mr. Cottingham, I didn't ask you that.

A. I am sorry.

Q. I am awfully sorry you misunderstand. I asked you what information—I will ask you again, what information will it give you?

A. A Schlumberger?

Q. Yes.

A. It shows within a radius, according to Mr. Buck of six feet around the well, what conditions obtain there.

Q. That is right.

A. With reference to porosity and saturation and water.

Q. Porosity, saturation and water, water?

A. Right.

Q. Then by those you can tell the water table, can you not?

A. That is right.

Q. Then by those you can tell the permeability and porosity and thickness, can you not?

A. The water table is reflected here.

Q. All right, you know where the water table is in the East Texas field. Then you know where the top of the sand is in the East Texas field?

438 A. The water table, we know it is variable, from whatever those distances are, over a distance of about seventy feet.

Q. All right. Now, Mr. Buck has prepared a sand map based on the cores of wells and Schlumbergers. Would you say whether or not that can be done accurately or whether or not you would give any credence to that map if it were so made?

A. Well, if it is based on cores, Schlumbergers, I would say that he could supplement it by well logs and it would be perfect.

Q. It would be perfect?

A. Yes.

Q. Then is there any reason why the Railroad Commission can't do the same thing?

A. Oh yes, they can construct the map.

Q. Now, Mr. Cottingham, let's get back to the question as to whether or not potentials show oil reserves under a particular lease. Is it your answer that it does show that?

A. It does.

Q. It does?

A. In some measure. It is one of the factors.

Q. All right.

A. First you have to have a well on the tract before you know whether you have any oil under there.

Q. That is right.

A. And second if you—the magnitude or the value of the oil land is based on whether you have a ten
439 barrel well or a thousand barrel well or what.

Q. That is right.

A. So in that relationship it does reflect something about reserves. It is one of the factors.

Q. Mr. Cottingham, I have drawn you a picture of a ten acre lease immediately adjacent to a one acre lease in the East Texas field. They are in the Fairway. It has a potential, according to your map, the one on the ten acres does, of 960 barrels an hour. The wells were equipped exactly alike. They were drilled to the same depth. The sand conditions are exactly the same as near as there can be exactness in any oil field. Will a potential test taken by the Railroad Commission in the manner that those tests were taken reflect the recoverable oil under each of those two tracts?

A. It is only one of the factors. It doesn't reflect the—it is only one factor.

The Court:

Don't they have to take acreage into consideration?

Mr. Tilley:

That is right.

The Court:

Let's get to it without going around so much.

Q. Then, Mr. Cottingham, you state it does not take into consideration the recoverable oil under those two respective tracts?

A. Potential?

Q. Yes, sir.

440 A. It is one of the factors. You mean that the two wells are exactly the same or you have a ten barrel well and a 1,100 barrel well, per hour?

Q. I will ask you this question, Mr. Cottingham; then does the Wood tract of one-tenth of an acre or do the Wood tract of an acre and the Rowan & Nichols tract have the same quantities of oil under them in your opinion?

A. No, I don't think they have the same quantity of oil.

Q. All right, does the five acres immediately adjacent to the Wood tract have as much or more oil than the Wood tract?

A. No, but I think that your permit on one-tenth acre has as much oil as the Wood tract.

Q. You mean the well has?

A. It would if you would drill that well.

Q. Is there as much oil under the tenth of an acre as there is under the five acres immediately adjoining if both have a permit and a well on them?

A. You have a permit on one-tenth acre, have you not?

Q. Yes, sir, and I have a permit as a direct offset to it on five acres. Now, does the five acres have more or less oil or the same amount of oil as the one-tenth of an acre next to it?

A. It is reasonable to presume that the five acres has more oil than the one-tenth acre.

Q. How much is more oil?

A. I wouldn't express it in terms of percent-
441 age.

Q. Now, Mr. Cottingham, if you had wanted to give any consideration to the recoverable oil over in the

East Texas field, since you had contour lines drawn showing the potentials of those areas, would or would it not have been a very simple matter to multiply the surface area times the potential to estimate the relative amount of oil each man was entitled to if he was permitted to recover the oil or equivalent of the oil under his particular tract?

A. You mean A times P?

Q. Yes, acreage times potential.

A. Let me have your question again, please. (Question read.) It would be a very simple matter to do the multiplication. Whether or not the recoverable oil in one tract bore the relationship to the recoverable oil in the other tract I don't know.

Q. Would the Wood tract and this one, take them together, would it work there?

A. Assuming—

Q. Acreage times potential.

A. Assuming any condition?

Q. Assuming what your potential map shows.

A. Acreage times pressure?

Q. No, acreage times potential.

A. Acreage times potential. It might or it might not.

Q. It might or it might not?

A. That is right.

Q. Well, why wouldn't it?

442 A. You can't always tell just the exact amount of shale. It would be reasonable to presume that it would closely approximate it.

Q. Your potentials show they have the same sand conditions, don't they, because they are the same?

A. That is correct. It would closely approximate it.

Q. And the same thing would be true all over the field, would it not, Mr. Cottingham?

A. That is right.

Q. All right. Now—

A. Now, this—

Q. Let me ask you this question, Mr. Cottingham—

The Court:

Counsel, this has been the most liberal fifteen minutes the Court ever saw.

Mr. Tilley:

Your Honor, I had no idea it would take me this long to get answers out of the witness.

The Court:

I think the witness has been fair.

Mr. Tilley:

I mean he has been lengthy.

The Court:

You are going into a great deal of detail that I don't see how it can have any bearing on the matter. You will have to get down to some broad general principals because the Court is not going to substitute his discretion for that of the Commission. You have to show that the way they have administered this is so wrong as to be confiscatory. So I don't see that we are getting anywhere by speculating whether it is a little better to do it this way or that way. It seems to me that
 443 there are some fundamentals here that haven't been gone into. I presume Mr. Cottingham has—
 I would like to ask him one or two questions and then I would like for you to bring your examination to a close. In preparing this order do you take any cognizance of acreage? Is that considered, do you know?

The Witness:

Not any more than the spacing plan provides.

The Court:

For instance, take this Rowan lease, as I understand it that twenty-five acres is practically the same, the thickness of sand, porosity, permeability and so forth are relatively the same on the Rowan lease?

The Witness:

Yes.

The Court:

Now suppose instead of being one ownership it was two. One man had twelve and a half and another man twelve and a half. One man brought in one well on his twelve and a half acres, a good strong well, and the other people drilled five or six wells on their land. How would you adjust it between those two people? Would that man be entitled to his one well, if it was capable of doing it, of getting his oil out under his twelve and a half acres, or would he just get one-fifth, if the other fellow had five wells?

The Witness:

No, he would be given—that particular well under the present scheme would be given, allocated its part according to its potential.

444 The Court:

I know, but suppose the potential on all six of the wells was the same?

The Witness:

They would all be given the same.

The Court:

Then the other people would get six times as much as the one with one well?

The Witness:

That is correct.

The Court:

The same size tract of land?

The Witness:

Yes, sir.

The Court:

And the same amount of oil reserves?

The Witness:

That is correct.

The Court:

Then you don't take acreage in as a factor?

The Witness:

No.

The Court:

As far as this order is concerned?

The Witness:

What is that?

The Court:

As far as this order is concerned you don't take acreage into consideration?

The Witness:

The spacing pattern takes acreage into consideration, but allowable is purely on potential.

The Court:

Over in the eastern part of the field the spacing is creating a disturbance?

The Witness:

I didn't understand.

The Court:

I say the spacing over in the eastern part of the field is practically gone, isn't it?

The Witness:

It has practically resolved itself into an exception to the spacing rule.

The Court:

I didn't understand what your idea was about that. How do you consider that?

445 The Witness:

Any common yardstick applied in any proration formula will possibly work an apparent hardship to one operator against another, but you can't apply it if you put just straight acreage into effect.

The Court:

I was just wondering whether you disregarded it altogether or not?

The Witness:

We have on the one hand a top allowable beyond which most engineers feel that physical waste will result if that is not maintained. Now, on the other hand we have 25,900 wells in the field. Now, if some of those wells are caused to flow more, by setting an arbitrary limit, beyond which we can produce, a certain amount of oil will be irretrievably lost, so the Commission is between, you might say, a rock and a hard place. There are some things you can't take into consideration. They have the limit, so far as the field out there is concerned they have the lower limit, beyond which I don't know whether they can reduce the wells.

Q. Mr. Cottingham, you stated that there were certain things that you could not take into consideration. Now, you were talking about the marginal well bill?

A. I am not a lawyer. I wouldn't know whether it is valid or not.

Q. You meant that if you went ahead and gave twenty barrels to each well and a minimum to those wells that could make it, then of course you could make an adjustment, is that right?

446 A. I don't believe I get your question, Mr. Tilley.

Q. I will ask you this question, Mr. Cottingham: the allowable for the East Texas field is approximately 500,000 barrels a day?

A. No, it isn't that much.

Q. How much is it now?

A. I will have to refer to—it is very much less than that. As your engineer recollected 400,000, and it is a little less than that at the present time. I think I have the figures here of what it is in February. The allowable assigns twenty barrels to each well that can make it, and twenty barrels of marginal oil and about 7,000 barrels of prorateable oil totals 522,863 barrels.

Q. That is what I said, Mr. Cottingham, that is what I asked you.

A. But the Commission has a Saturday and Sunday shutdown during the month of February, in which there are eight days. Then the allowable for the East Texas field is 373,473 barrels as of February first.

Q. Now, Mr. Cottingham, if you would reduce it one more day, if you would close in the field one more day per week, then you could then increase the monthly allowable, you could increase the allowable per day that way over the month so that you could then give a bigger variation in allowable to the bigger wells than you would the smaller wells, could you not?

A. The Commission could, I couldn't.

447 Q. Then that does not keep you from giving a wider variance in the worst well or practically the worst well in the field and the best well in the field?

A. The Commission could.

Q. Then the East Texas field could be taken off of a practically per well basis by closing in that field, as you are now doing, one more day a week and in that way then you could give the additional oil to the best wells in the field, is that not right?

A. We could just produce it one day and do just as you say if the Courts would permit us.

Q. Now, do you know what the interpretation of the Railroad Commission is as to what the marginal well bill requires them to do or how they have been interpreting the marginal well bill in fixing their allowables for the East Texas field?

A. I wouldn't speak for the Commission.

Mr. Hart:

We object to that as being irrelevant and immaterial.

Mr. Tilley:

All right, I will withdraw that question.

The Court:

I don't know that the bill is under attack here in this suit, is it?

Mr. Tilley:

Yes, sir.

The Court:

Well, the method of its application and enforcement would be material, wouldn't it?

448 Mr. Hart:

I didn't understand it was under attack.

The Court:

Overrule your objection.

Q. What is the interpretation of the Commission as to the meaning of the marginal well bill as applied to the East Texas field?

A. All I can answer is I can't answer for the Commission's interpretation of the marginal well bill only in so far as they have, in the interest of conservation of the field, in setting the top allowable for the field, have closed the field—by reason of the fact that to grant each well the marginal well allowance would result in physical waste if all the wells in the field were given twenty barrels a day—they have indicated that in the interest of conservation that they would close the field down on Saturdays and Sundays or the equivalent amount. They would not necessarily close the field—let me correct that statement. The field operates pretty uniformly. There are several gasoline plants over there and the operators are permitted to operate their wells continuously to supply casinghead gas to these gasoline plants, which in turn supply gas to 50,000 people. And so they have a provision in the break-down order which provides for a continuous operation, but to curtail the production during January 8/31st of the production and during February 8/28ths, or eight days in each month.

Q. Then there are wells producing in the East Texas field less than twenty barrels per day, is that right?

A. All of them are.

449 Q. There are some producing less than twenty barrels per day?

A. By reason of the Saturday and Sunday shutdown. If you will divide 25,765—no, 25,807 into that figure I gave you awhile ago it will give you about fourteen barrels, I

believe, for the lowest well that can make fourteen barrels.

Q. You know as a fact, do you not, that the Railroad Commission fixes an allowable of twenty barrels per well per day for every well in the East Texas field that will make twenty barrels a day, regardless of any other conditions over there in the East Texas?

A. If it can make twenty barrels.

Q. If it can make twenty barrels a day?

A. It is so indicated on this schedule.

Q. That is your application or the Commission's application of the marginal well bill to that field, is it not?

A. It is placed on the schedule at twenty barrels and then the Saturday and Sunday shutdown, as previously explained, applies across that.

Q. Then if you multiply seven times the allowable and apply that weekly allowable for the whole week instead of five days a week your wells will be making on an average of less than twenty barrels a day will they not?

A. If you multiply the wells by seven?

Q. Yes.

A. Well, there are—

Q. You multiply the allowable, the daily allowable by seven, the actual amount that they are producing per week under the allowable for the East
450 Texas field, multiply that by seven and divide it by the number of wells and you will get for the 21,000 some odd wells over a seven day week less than twenty barrels per day, will you not?

A. You mean to say that are the wells now getting less than twenty barrels that can make it?

Q. I say the 21,000 wells are getting twenty barrels five days a week. Now, if they were getting the same allowable seven days a week they would be getting less than twenty barrels per day?

A. If the Sunday shutdown was distributed over seven days a week?

Q. That is what I mean.

A. I believe that the majority of the wells would be producing less than twenty barrels.

Q. That is right. Now, Mr. Cottingham, there are some wells producing on the pump as little as five or ten barrels a day and operating aren't there?

A. There are 451, of which the size I can't give you here, that produce—that are incapable of making their marginal allowance of twenty barrels. They average only 11.6 barrels, and the Sunday shutdown applies against those wells.

Q. And there are quite a number of wells making less than five barrels?

A. I can't answer you on the number, but that figure is available in our Kilgore office.

451 Q. All right. Now, Mr. Cottingham, in the reducing of the allowable of those wells so they now produce about ten barrels a well is that creating waste in the East Texas field?

A. I would have to have the individual well and make an analysis of that. I am sure that some wells possibly should not be producing large quantities of water, but I don't know how we can stop it.

Q. All across the whole field there it is not creating waste generally in the field?

A. An overall picture of the field, I think the East Texas field is the best regulated field that has ever been regulated, from an all over picture.

Q. From the standpoint of waste?

A. From the standpoint of waste, yes.

Q. The submarginal wells, are they reduced to five days a week too?

A. All of them are in the State of Texas unless given special exemption, and I know of but one or two wells in the East Texas field that have been given special exemption by reason of large quantities of water.

Q. Now, Mr. Cottingham, there are other fields in the state which are allocated by the potential times acreage, aren't there?

A. Yes.

Q. Now, if there are 251 such orders in Texas why would not that same order apply to the East Texas field?

A. I said that there were 251 wells in Texas—

452 Q. Fields?

A. 251 fields in Texas that are producing on a per well basis, of which the East Texas field is fast approaching a per well basis.

Q. Yes. Now, do you have numerous fields in Texas that you allocate the allowable on an acreage times potential basis?

A. We have none.

Q. In truth and fact you do have because those fields have uniform spacing rules and they are very strictly abided by and you have uniform distances between wells and property lines?

A. In which?

Q. In these fields wherein you consider acreage by virtue of the fact—potential by virtue of the fact that you have uniform spacing?

A. We have sixty-six wells—fields in Texas that are prorated on marginal plus potential. I don't believe that you could pick sixty-six wells in Texas that would have uniform spacing conditions.

Mr. Hart:

Fields?

A. I mean fields.

Q. Mr. Cottingham, if the East Texas field had been developed on the spacing regulation promulgated for that field, that is 330 feet from wells to property lines and 660 feet between wells, would not have that order, together with potential if potential means what you say it does, would not that have put the East Texas
453 field in effect on an acreage times potential basis?

A. If the acreage pattern in the East Texas field had been uniformly sectionized, large ownerships, but on the contrary, as Mr. Buck explained—

Q. Answer my question, Mr. Cottingham, please.

A. Okeh. Thank you—pardon me. If it was uniform it would be straight acreage.

Q. It would be straight acreage times potential?

A. What is that?

Q. Times potential if you gave consideration to position on the structure which the Courts have talked about, and you had uniform spacing throughout that field, then you would give consideration to acreage times potential, which is the ability of a man's well to produce times the amount of oil underneath his tract, is that not right?

A. Mr. Rice, I do not pass on the merits of these various spacings and I don't know what kind of factors would obtain, but I do know that the East Texas field, if we had back of us all of the experience we have now and could start out it might be an entirely different picture, but we have it obtaining as it is today and we can't change the pattern.

Q. Mr. Cottingham, I understand that, but when you deviate from that spacing regulation and grant some 19,000 exceptions or 16,000 exceptions to that spacing rule do you not then take it off of an acreage times potential basis where you have uniform spacing and drill 454. so many wells that in order to give a man what he is entitled to or the amount of oil equivalent to that which underlies his lease you have to then estimate some way or figure out some way to give him his oil when you take it off a well basis?

A. You don't take it off an acreage potential because that has never been—you would take it off a primary acreage basis, and we have, I think, only one field that has a strictly acreage basis, and it incidently does—I will refer to my map—have a somewhat uniform spacing pattern.

Q. Mr. Cottingham, if you would take the East Texas field and multiply surface acreage which you know, do you not? You know the surface acreage from your map?

A. Oh, yes.

Q. Multiply it times the potential and would it not have the same effect as how the allowable would be allocated in the East Texas field if you had uniform spacing of 330 and 660, with few exceptions?

A. No.

Q. Why would it not?

A. If it was absolutely uniform, yes; if there were no exceptions it would be exactly the same.

Q. It would be practically the same if you even took into consideration the small tracts in the field?

A. It wouldn't be in East Texas.

Q. East Texas was cheap land, was it not, when that field was discovered?

455 A. It wasn't cheap long.

Q. I know, but it was at that time though; those farms over there were from fifty to sixty acres, were they not?

A. It was cheaper than that before oil was discovered.

Q. I am not asking you that, Mr. Cottingham. I just asked you whether or not the East Texas field was divided into farms and large tracts over there before oil was discovered?

A. No, there was Negroes, and it was one of the most mixed up title situations that ever existed.

Q. I am talking about sizes of tracts, not titles.

A. I am talking about sizes of tracts too.

Q. That is right.

A. Partitions where you had somebody that didn't record the deeds; and you had a lot of illegitimate children and they married without getting divorces and they would run the lines from one original survey and some would run from the other and they had overlaps, they had vacancies. It was the terrible mess that was ever known in title surveys.

Q. Rule 37 was promulgated in 1919, wasn't it?

A. I think so.

Q. Now, where that same situation prevailed in the Houston field the Railroad Commission caused them to unitize, didn't they?

A. Houston okeh. The South Houston City ordinance which did that in the protection of life and property.

456

Q. Now, Mr. Cottingham, you know of your own knowledge that the Railroad Commission has granted two to three to four to five wells on one lot owned by one man in Kilgore and London and throughout the whole East Texas field?

A. I know that condition obtains, but I don't know the facts.

Q. Now, the more wells you drill on those tracts the more oil somebody is going to get, is that not right, of somebody else's?

A. That is right.

Q. Under the present.

A. It is axiomatic.

Q. How does the present plan of proration attempt to take care of the other operators who have drilled on a reasonable basis and tried to get only their own oil, as compared with those people that have acted in a spirit of greed?

A. I wouldn't substitute my opinion for the Commission's opinion. As I have stated, I don't know the condition obtaining that caused the Commission to grant these permits, but I know that all permits were granted after due notice of hearing as provided by law, and that they granted them.

Q. No operator in the field except an adjacent tract has a right to knowledge of those grants, has he?

A. I wouldn't know that.

Q. You know the policy of the Railroad Commission is not to give anybody notice of that except the immediate lease owners, you know that?

A. That is correct, those that are directly affected. I think the law prescribes that.

Q. Those immediately adjacent to that lease?

A. They wouldn't issue notices of hearing to the 11,000—I mean more than 1,100 separate and distinct operators in the East Texas field. They could if anybody requested it, and there are certain agencies that get all those permits.

Q. You mean there are certain persons that practice before the Commission?

A. That is right, certain people that request them and they are given those permits or they are available to them at all times. The office is open to anybody in Austin here.

Q. Now, Mr. Cottingham, can you tell this Court why the Railroad Commission granted as many as five or ten permits on one single acre owned by one single man?

A. Ten?

Q. Yes, sir, ten?

Mr. Mahon:

Your Honor, we object to that.

The Court:

Sustain the objection.

Mr. Mahon:

We object to any of this line of questioning.

The Court:

I can't give you a blanket suspension here. I sustain the objection to that one question.

Q. I will ask you this, is it in contravention of waste?

A. What?

458 Q. Would the granting of permits for five wells on one acre in the Kilgore area, would that be conducive to or preventive of waste?

Mr. Hart:

We object to that as being a collateral attack.

Mr. Tilley:

One moment, please.

The Court:

These orders have to act prospectively and the Court has to act on them prospectively. I can't say this present order is invalid because you have done something wrong in the past, if it be true they have done something wrong. You have 25,000 wells here. You can't try each one of them. We have to face a condition here as it is. The Commission has these wells and they have to write an order. If they write an order that operates in such a discriminatory fashion as to constitute taking of one man's property let him come in and show it, but I don't understand you can upset the whole thing on that unless the order is void on its face. You are trying out an awfully wide swath here and you are fixing to try matters that I am not interested in. The question about the Commission granting these permits, they are granted, they are there.

Mr. Tilley:

All right, I will refrain, your Honor.

The Court:

If the fact they are there operates to make this order bad we will test the order out by the facts as they exist now.

Q. Now, Mr. Cottingham, you stated that if any person was dissatisfied with a potential given his well
459 that he could come to the Railroad Commission and ask for a new potential to be taken?

A. Anytime that an operator felt that his well was not in the proper brackets according to this potential map the Commission was always willing and ready to take the potential of his well and let his well rest on what it showed.

Q. Now, Mr. Cottingham, confiscation of an operator's property over there is caused not because his particular potential may not be what it should be, but because somebody else's potentials are higher than they should be. Now, it costs about \$1,000.00 apiece to take those potentials, does it not?

A. It didn't cost the operator one red cent because in as much as it was a community proposition and in as much as it was a common reservoir the Commission granted each operator the amount of oil, after he would make an inventory at his expense to take the potential, they would let him run that much oil to pay for the taking of the potential.

Q. He is taking oil then while the other wells are closed in, is that it?

A. No, the potentials were taken under operating conditions.

Q. I mean he is taking a thousand barrels of oil more than other operators are permitted to take?

A. Yes, but it was a kind of community proposition. He didn't get any benefit for taking it because he was given a quantity sufficient to exactly pay for the
460 taking of the potential.

The Court:

What has that to do with it?

Mr. Tilley:

I just want to show, your Honor, that the method and cost is prohibitive of Mr. Rowan coming in and asking for a potential to be taken on his well or on Wood's well.

The Court:

They have taken potentials on his wells haven't they?

Mr. Tilley:

Yes, your Honor.

The Court:

They have shown they are among the best in the field, they are in the top brackets?

Mr. Tilley:

That is right.

The Court:

And he has filed his application with the Commission to have it done a different way and it was denied and he has filed an application to drill eighteen or so wells and that was denied. You couldn't make the order void because it takes \$1,000.00 to take a potential.

Mr. Tilley:

It goes to the reasonableness of the plan, your Honor, because he has to take not only his potential, but these potentials are admittedly on the east side out of line.

The Court:

I understand that. You have developed that very fully. Now, you have this huge field and thousands of wells and they have only taken a few key wells, about seventy-one, and you say that isn't enough and it is too expensive to

461 take more. The question of whether that is the best way to do it or not you can argue about later. He stated all the facts about it. Don't argue with the witness.

Q. Mr. Cottingham, you have potentials shown there of wells on the east side of from 100 to 500 barrels. Now, most of those wells are pumping wells, are they not?

A. I wouldn't state that most of them are.

Q. A large number of those wells?

A. I would say the poorest wells around the periphery of the structure, that are around the periphery.

Q. Are pumping wells?

A. That is correct; that is what you would expect.

Q. Then if those wells are pumping wells, what is the maximum a well can pump in the East Texas field, over there on the east side, per hour?

A. Some of them, you know, have been plugged.

Q. Well, of course I am not talking about a plugged well. I am talking about a well that is pumping.

A. Some of them can pump five or six barrels a day.

Q. What is the maximum.

A. Right on the margin of the field.

Q. Mr. Cottingham, what is the maximum number of barrels per hour that any well on the east side can pump, on the east side of the East Texas field, that is all I want to know?

A. There are hundreds of wells there, and I don't know the exact status of them and nobody would know until they go in there and run a potential test. And let me tell you how long it takes to run a potential
462 test—

The Court:

Don't tell him that.

Q. Mr. Cottingham, you don't understand my question, I am afraid. In order to take a potential test on a pumping well all you have to do is pump that well, isn't it?

A. The first thing you have to do in the East Texas field, we have learned by experience, is first to see if the well has been loaded. Then we do that by pumping the capacity of the casing first or until it pumps off. Then you start your test and pump it for twenty-four hours as hard as you can, and that is a twenty-four hour potential test.

Q. Now you still haven't answered my question.

A. I am sorry.

Q. I want to know what the maximum a pumping well in the East Texas field will pump, in your opinion?

A. The maximum?

Q. That is all I want to know.

A. You know there are several types of high pressure pumps. One is a casing pump. That has no tubing and things. Some of those pumps, if the fluid would enter the hole at 3,600 feet it would pump four or five thousand barrels daily. It is owing to the size of the casing and working barrel. If you get a Reeder pump where the pump is down in the bottom of the hole and put on lots of electricity you might pump slightly more than the casing pump. And it is owing to what the oil level, whether it will bring the oil into the hole fast enough.

Q. Then instead of producing four or five hundred per hour they will produce four or five hundred barrels a day?

A. I don't know of a pump that will deliver 500 barrels a day.

Q. All right, what is the highest?

A. I wouldn't make an offhand estimate. I am not an expert in pumping equipment. I know about pumping equipment by coming in contact with people, but I am not familiar with the highest rate pump there is. I know you can deliver more fluid at a lesser depth than you can at a greater depth.

Q. Now, Mr. Cottingham, to all the wells in the field which have a potential of 860 barrels per hour or less, down to one barrel, you give those the same number of barrels per day in allocating your allowable that you give to the Rowan & Nichols Oil Company, which has a well that will produce 20,000 barrels a day?

A. Rowan & Nichols' wells, I believe, average about 22.3 barrels per well, and those wells from the 860 contour line down to zero average, all of them average twenty barrels if they can make it, and if they can't make it they are given what they can make, less Sunday shutdown, but since that map went into—

Q. That is regardless of the size of the tract, whether a hundred acre tract or one acre tract, as long as the spacing is one well to ten acres it doesn't make any difference about that?

A. You mean one well on a hundred acre tract?

Q. Yes.

A. There aren't any over there.

Q. Well, one on twenty.

A. There aren't any over there.

Q. On ten.

A. Unless it is around the margin of the field, and in a spacing rule of ten acres you never assign more than one well unless it is in the center of the field.

Q. I will ask you this question, you give to one well on ten acres in the heart of the field, in the Fairway, that will make 20,000 barrels a day, you give two barrels less to that well on the east side or the east on one-tenth of an acre that will not produce but twenty-one barrels a day with the well wide open or however you try to flow it?

A. I know of no well in the Fairway that is—that has a density of one well to ten acres. They have taken advantage of that and have drilled more wells than that.

Now, around the periphery of the field you will find that.

Q. If there are such wells, Mr. Cottingham?

A. Yes, I stand corrected if there are such wells.

Q. And there are a number of wells over there on small tracts?

A. Yes, sir.

The Court:

Why don't you stay on your own tract? It has to be bad as to you.

Q. Now, Mr. Cottingham, if there is one acre in the Wood tract and twenty-five acres in the Rowan tract and you give to each the same allowable per day you are giving Wood 250 times, per acres, more oil?

A. That is when you apply a common yardstick across the field?

Q. With the order you have right now.

A. You will have those inequities in any order.

Q. This order I am talking about.

A. I am talking about this order or any other order.

Q. Or any other order?

A. Any other order that I know of.

Q. Well, now let's take the Van Field order. Would it—

The Court:

Let's not do that.

Q. I withdraw the question. Now, Mr. Cottingham, is that in your opinion a reasonable allocation of the allowable?

Mr. Tilley:

I withdraw that question. That is all, your Honor.

Mr. Hart:

Before I forget, I want to formally offer the exhibits that have been marked for identification, with the exception of Exhibit No. 21 which is duplicated by 22, except that exhibit. No. 22 is on a smaller scale.

(The above referred to exhibits were thereupon received in evidence, the same having been marked Exhibits 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38 and 39.)

Cross Examination (Resumed).

By Mr. Tilley:

Q. I will ask you this question: under your present plan of proration isn't it a fact that you give a distinct advantage to the Wood tract over the Rowan & Nichols tract?

A. I believe that is obvious, Mr. Rice.

Q. That is all.

A. In that particular instance as you would in any formula that you applied a common yardstick to across the field, of a field the size of the East Texas field.

Re-Direct Examination.

Questions by Mr. Hart:

Q. Now considering the Rowan & Nichols tract not just with relationship to that one isolated tract, but consider it with the average of all the surrounding leases or the average of the leases to the edge of the field on the west or on the east, or considering it in relation to the average density of the field as a whole, is Rowan & Nichols in any disadvantage?

A. I believe their density is a little greater than to the west of them, to the east of them, to the south of them and to the west of them than is the field as a whole.

Q. In other words they are more densely drilled when you consider those averages than are their surrounding tracts?

A. We prepared those break-downs and that is correct, I think that is correct.

Q. All right, then if you would take into consideration an acreage times potential method of allocation they would actually get less share in the oil than they are getting under a straight potential allocation, wouldn't they?

A. Acreage times potential?

467 Q. Yes, sir.

A. We made that calculation and come to that conclusion.

Q. For the reason that they are more densely drilled than the average of the field, for that reason acreage times potential would give them—

A. They would have less allowable than they have now under the present acreage times potential because they are more densely drilled than the field.

Q. Now, Mr. Tilley talked about these persons that drilled up to greater density than their surrounding tracts to get a greater amount. Do you know the history of the Rowan & Nichols tract? Do you know whether they drilled up more densely than the surrounding tracts throughout the operation of that lease?

A. I know that only so far as I heard the testimony of Mr. Rowan, he admitted he led the density of drilling in that area.

Q. So they are not hurt?

A. So far as density, no.

Q. Now, of course the potential does not reflect the acreage of a lease, does it?

A. What is that?

Q. The potential of the wells on the lease do not reflect the acreage?

A. No, you might have a well on one hundred acres or a well on a tenth.

468 Q. So if a man feels he is being damaged because of the fact he is not as densely drilled as his neighbors he is not taken care of by the pro-
 ration order, but by the rule of the Commission that allows him to drill to the density of the surrounding tracts in order to prevent confiscation?

The Court:

He is granted administrative relief by the Commission and final relief by the Courts.

Q. Mr. Tilley asked you about what might have happened if instead of having two days shutdown you cut them down so they produced just one day a week. Now, wouldn't the effect of that be to cut down on the marginal allowance of these wells so they wouldn't produce enough to afford them to operate and the results would occur which you have already talked about, the wells would be abandoned and wells lost in those instances?

A. It would be designed to reduce the wells on the smaller tracts to a level which they could not produce, which would in my judgment create physical waste.

Q. Just one other thing. Mr. Tilley, I think, asked you some questions which might lead a person to believe that calculating the surface acreage of some of those leases in the East Texas field would be a simple matter. Do you know whether or not as a practical matter it would be very difficult to determine the exact acreage because of disputes between adjoining land owners, as between the dispute between Wood and Rowan?

A. It would be difficult to determine the Wood tract.

469 Q. And aren't there situations all through the field that would make it complicated to give weight to acreage?

A. I don't have that information before me, Mr. Hart.

Q. All right, do you know any two acres in any field that have exactly the same amount of recoverable oil underneath them?

A: Nobody knows. You can't look down there and find out how much oil is there.

Q. Well, there is a variation from acre to acre, is there not?

A. Correct.

Q. And the extent to which you put in an acreage factor, you are necessarily putting in a factor that is subject to error, are you not, because of the variation between acres?

A. Of course in the relationship that one acre varies to another, which is an unknown quantity; there would be that variation.

Q. Because of the density of drilling on the Rowan & Nichols tract are they or not producing more per acre than the average of the whole East Texas field?

The Court:

I think that has been asked a number of times.

Mr. Hart:

I didn't know that particular question had been covered.

The Court:

You might not have asked it exactly in those words, but it has been proved they are more densely drilled.

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Re-Cross Examination.

Questions by Mr. Tilley:

Q. Mr. Cottingham, in taking into consideration acreage, if there was some dispute you could have a hearing and adjust that?

A. Well, I don't believe the Commission—

The Court:

That is an argument, isn't it? I have no doubt the Courts could find out where the property lines are.

Q. When you said that the acreage times potential method would give Rowan less didn't you assume some minimum or maximum there?

A. No. I think that can be readily calculated from my breakdown, but I think we calculated it—

Q. You didn't assume twenty barrels for all wells by any chance?

A. I don't know; I am not sure about that part.

Q. Well, you know what you made an important calculation of that kind on, don't you, Mr. Cottingham?

A. Yes, we had the break-down there, and in general terms—I am not sure about that particular thing.

Q. Well, explain to the Court what acreage times potential is. It doesn't give any consideration to the number of wells.

A. Say the potential of the well is a thousand and it has one acre. It is one times a thousand. And suppose you have ten acres and have two wells—have one well on ten acres and it has 300 pounds pressure. That would
471 be 300 times ten and then you would add all those factors up and allocate on that.

Q. Then to take true potentials times acres you have to give no consideration on any minimum allowable or to the number of wells on that tract?

A. I don't get that?

Q. In order to determine accurately the effect or result of acres times potential you do not take into consideration any minimum allowable or the number of wells on any particular tract?

A. Well, I think if you had a marginal well law and you tried to live under it, A times P would give you twenty barrels. The Commission would be inclined to give that well twenty barrels whether the formula gave it or not.

Q. Yes, you took that minimum then, didn't you?

A. I am not sure really; I didn't make the calculation and I don't know.

Q. Well, isn't it your best recollection?

A. What is that?

Q. Isn't it your best recollection?

A. I don't want to beg the question. I would rather say I just don't know, I don't know the result.

Q. Well, will you multiply that before you come back to the Court and tell the Court whether or not it is 151 barrels instead of 111 barrels?

A. If the Court so directs.

Q. In order to clarify your own testimony and in fairness to this plaintiff won't you do that?

Mr. Hart:

We will have those calculations available.

Q. Now, there is no rule of the Railroad Commission is there that has been promulgated which provides in determining whether or not you will grant a permit that you will take eight times the area of that particular lease upon which the permit is applied for?

A. I believe that is a policy that the Commission worked out to try to—

Q. It is not a rule or order of the Railroad Commission?

A. It is more of a policy, I think, more than it is any rule, but everybody is familiar with it and they can appear before the Commission to give such testimony as Mr. Rowan did.

Q. Now, Mr. Cottingham, you have determined the maximum amount of oil that is allocated on a potential basis for that field is approximately 7,000 barrels?

A. What is that?

Q. You stated, I believe, that the maximum amount of daily allowable that is allocated on the potential basis or potential order that you now use was 7,000 barrels. That is right, you stated that this morning, didn't you, or did I misunderstand you?

A. On what basis.

The Court:

I don't understand your question.

Mr. Tilley:

Your Honor, I asked him this question—

473 The Court:

Restate it if you can.

Q. What is the amount of daily allowable that you allocate among the wells in the field, to those wells which are not given the marginal of twenty barrels a day?

A. Every well in the field is given twenty barrels.

The Court:

I asked him that myself and he said about 7,000 barrels.

The Witness:

The proratable oil, yes.

The Court:

That surplus you have that you can prorate among the bigger wells. What about it now?

Mr. Tilley:

I just wanted to be sure that he had brought it out and that was the testimony. That is all.

(Witness excused.)

(At this time a recess was taken in this case until 9:30 o'clock a. m. of the following day, February 9, 1939, at which time the following proceedings were had:)